Medical Lib. JUN 21 1928

VOLUME IX JUNE, 1928 No. 6

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

WITH

INTERNATIONAL ABSTRACT

Official Journal American College of Physical Therapy

EDITORIAL STAFF

DISRAELI KOBAK, M. D., Editor

GEORGE C. ANDREWS, M. D. - - New York
ALBERT BACHEM, Ph. D. - - - - Chicago
R. C. BAUMGARTEN, M. D. - - - Seattle
W. T. BOVIE, Ph. D. - - Northwestern Uni.
WILLIAM L. CLARK, M. D. - - Philadelphia
HARRY H. BOWING, M.D., Mayo Clinic, Rochester
IRA O. DENMAN, M. D. - - - - Toledo
J. C. ELSOM, M. D. - - - - - Madison
F. H. EWERHARDT, M. D. - - - St. Louis
R. E. FRICKE, M. D. - Mayo Clinic, Rochester
J. U. GIESY, M. D. - - - Salt Lake City
ABRAHAM J. GOTTLIEB, M. D. - Los Angeles
E. N. KIME, M. D. - - - - Indianapolis
HARRY LESLIE LANGNECKER, M. D., Stanford U.
HORACE LOGRASSO, M. D. - Perrysburg, N. Y.
EDGAR A. MAYER, M. D. - - Saranac Lake
ROSWELL T. PETTIT, M. D. - - Ottawa, Ill.
CURRAN POPE, M. D. - - - - Louisville
CHAS. E. STEWART, M. D. - - Battle Creek
F. H. WALKE, M. D. - - - - Shreveport
A. D. WILLMOTH, M. D. - - - Louisville

ELKIN P. CUMBERBATCH, M. A., MB., (Oxon) M. R. C. P., London
GUIDO HOLZKNECHT, Dr. Med. - - - - - - - Vienna
A. ROLLIER, M. D. - - - - - - - Leysin, Switzerland
ALBERT E. STEIN, Dr. Med. - - - - - - - Wiesbaden
AXEL REYN, M. D. - - - - - - - - Copenhagen
FRANZ NAGELSCHMIDT, Dr. Med. - - - - - - - Berlin
DR. JOSEF KOWARSCHIK - - - - - - - - - Vienna
SIR HENRY GAUVAIN, M. D., M. Ch. - - - Alton, England

ALBERT F. TYLER, M. D., Managing Editor

Published Monthly. Annual Subscription, United States and Canada, $5.00; Foreign, $6.50.
Copyright, 1928, by Magic City Printing Co., Omaha.

ARCHIVES OF
PHYSICAL THERAPY, X-RAY
RADIUM

VOL. IX JUNE, 1928 NUMBER 6

THE THERAPEUTIC EFFECTS OF HEAT FROM VARIOUS SOURCES*

JOHN HARVEY KELLOGG, M. D.
BATTLE CREEK, MICH.

Heat is described by modern physicists as a radiant force, a form of electro-magnetic energy consisting of a series of wave movements of varying frequencies, travelling in straight lines at a uniform rate of a little more than 186,000 miles per second. The sensible heat which is recognized through the thermic nerves and may be measured by the thermometer, is the result of the increased molecular activity set up by the impact of heat rays.

The length of light waves naturally varies with their frequency; the greater the frequency, the less the wave length. The whole range of the heat orchestra—to use a musical analogy expressed in Angstrom units, is from about 4,000 to 200,000 Angstrom units.

The purpose of this paper is to point out some of the ways in which these differences in the properties of heat rays of different wave lengths, give rise to differences in therapeutic effects and how therapeutic effects are influenced by the sources from which the heat utilized is obtained.

The usual sources of heat employed for therapeutic purposes, are hot water, steam, hot air, the incandescent lamp, the electric light, arc, incandescent filament or heating element, the sun, and diathermy.

*Read at the sixth annual meeting of the American College of Physical Therapy, Chicago, Oct. 31, 1927.

Heat rays having a wave length of 7,000 to 4,000 Angstrom units are visible, the longest giving the dull red color of the spectrum; the shorter, the orange and yellow. These rays have remarkable penetrating power. For this reason, lamps which produce a reddish or orange colored light are employed for marine beacons instead of brilliant white lights, when shipping is menaced by fogs. Such lights can be seen at a much greater distance through fog or mist than can the most powerful white lights.

Heat waves longer than 7,000 are invisible, the so-called infra red. Considering the range of the visible spectrum 4,000 to 7,000 as an octave, the entire gamut of heat rays has a range of more than eight octaves. Of this great range of infra red heat rays, only half an octave, 7,000 to 10,000 Angstrom units, have more than very slight penetrating power. Hence, although long infra red heat rays are emitted by all non-luminous heated bodies, they have practically no penetrating power, this property being confined to the rays of the octave between 5,000 and 10,000 Angstrom units, half of which falls within the visible region of the spectrum and half within the invisible infra red region. It is thus clearly evident that heat from different sources differs greatly in availability for therapeutic uses.

Radiant heat from luminous sources—the electric arc, incandescent filament or heating ele-

ment, acts at a distance. Non-luminous heat sources, hot water, hot vapor, hot air, hot water bags, etc., must be brought into direct or immediate contact with the body to make their heat available, for the heat from such sources can enter the body only by conduction. The heat of a Turkish, hot air, or vapor bath, heats the most superficial layers of the skin by contact and by the gradual heating of the underlying layers of tissue, one after another, the vascular tissues are finally reached, after which little further penetration occurs, because the heat is carried off by the blood stream as fast as it penetrates the vessel walls.

My attention was called to the remarkable penetrating power of radiant heat by an accidental observation made many years ago (1891). In turning off an electric light bulb, my hand came between the incandescent filament and my eye, and I noted a red glow of the fingers, indicating that the rays were able to penetrate the tissues a distance at least equal to the diameter of my fingers. I at once began a series of experiments which demonstrated that the red rays were able to penetrate the tissues to a depth of several centimeters.

These observations led me to construct a variety of appliances for making therapeutic use of incandescent lamps and carbon arc lamps, photophores for local use and cabinets for general applications.

At the fourth annual meeting of the American Electrotherapeutic Association (1894), I read a paper in which I gave a summary of the results of an extended research in which the effects of the incandescent electric light bath were compared with the reactions obtained from the Turkish and Russian baths in an effort to put the use of the electric light upon a rational basis.

It was demonstrated that the electric light bath as compared with the Turkish and the Russian or hot air and vapor baths, produced first, greater elimination of CO^2 (25 per cent increase); second, a marked increase of perspiration. It was also noted that perspiration occurred much sooner in the electric cabinet bath than in the Turkish or Russian bath.

In experiments made in December, 1891, for the purpose of determining the effect of the electric light upon the surface and internal temperature and perspiration, I noted the following: The temperature of the skin before the bath was 95.44° F. and the internal temperature 98° F. The temperature of the air within the cabinet was 94° F. The patient began to perspire at the end of one minute. He was removed at the end of five and a half minutes, when the surface temperature was found to be 100.2° F, an increase of nearly 5 degrees. The internal temperature was 99.6° F., an increase of 1.6° F. At the end of ten minutes, the patient's temperature had returned to normal.

In a paper contributed in 1897 to a work published in celebration of the fortieth anniversary of the graduation of Professor Winternitz as a physician, I remarked that the purpose "in employing heat by irradiation is to produce more profound effects by heating the deeper lying structures and thereby reaching a greater number of nerve fibers and so profoundly affecting the nerve centers and various nutritive processes. I think it even possible that the deeper lying organs may be influenced to such a degree as to profoundly affect metabolic processes."

I also noted that the non-luminous heat waves are less penetrating than luminous.

A little later Professor Winternitz began the use of the bath and noted the following:

"In the electric-light bath, the heat elimination and the excretion of effete matters which accompany vigorous perspiration proceed with increased activity at the same time the rays of radiant heat are penetrating the tissues, elevating the temperature of the blood, and quickening all the vital processes.

"The importance of this property of the electric-light bath is clearly shown by the interesting experiments of Conrad Klar. This investigator showed by calorimetric experiment that with the body exposed in an atmosphere somewhat below the body temperature, heat elimination was during the first ten minutes ten times the normal amount; while during the second five minutes the amount of heat eliminated was half as great. The diminished loss during the second five minutes was doubtless due to contraction of the blood-vessels of the skin. In the electric-light bath the cutaneous vessels are

thoroughly relaxed, and this condition is maintained by the action of the rays of light falling upon the skin while the air about the patient is but little above the ordinary atmospheric temperature, a condition which in the highest degree favors heat elimination.

"The electric-light bath is a new invention by Kellogg, Battle Creek, Mich., U. S. A. It is undoubtedly true that radiant heat penetrates the tissues much better than conducted heat, and it is very probable also that the inner life of the cell is influenced by the radiant heat, both quantitatively, and to a higher degree. All the effects of the vapor bath can be produced by the electric-light bath. The loss of carbonic acid gas is considerably greater in the electric-light bath than in the vapor bath, and what is especially remarkable, perspiration occurs very quickly and at a very low temperature, and is very profuse."

Indications of perspiration are sometimes noticed at 28° C. (95° F.) The author has observed perspiration at 85° F., and Professor Winternitz stated to him personally (1899) that he had seen moisture appear upon the skin in a single instance at 65° F.

THE EFFECT OF LUMINOUS HEAT ON MUSCLE DEVELOPMENT

Since these early observations were made, the electric light in various forms has come into general use and numerous observers have made careful study of the effects of the carbon arc light, the mercury arc or quartz light and the incandescent filament; and numerous new facts have been developed which demonstrate even more clearly the superiority of the sources of radiant heat for therapeutic purposes.

Rollier has repeatedly called attention to the fact that the muscles of greatly emaciated patients grow and develop until their bodies become round and plump as those of athletes, as a result of lying nude in the sunlight for several hours daily, and without taking exercise, which has generally been regarded as absolutely essential for muscular development. A little less than two years ago I visited Rollier's establishment at Leysin and saw scores of such patients, whose muscles had thus developed and were as hard as though they had undergone training for athletic events, although they had been lying in bed for one or two years without exercise. I have noted a similar development under the influence of sun baths and arc light baths in very advanced cases of peritoneal tuberculosis, and numerous examples of the same transformation may be seen at Perrysburg, New York.

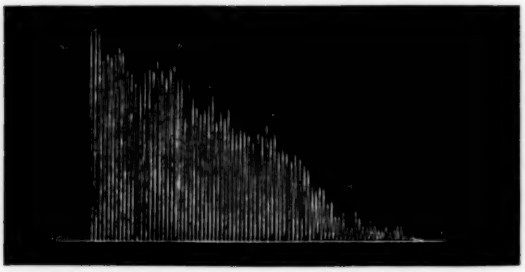
These laboratory experiments clearly demonstrate that the non-penetrating infra red heat rays depress the neuro-muscular mechanism, whereas, the penetrating luminous rays of the arc light have a powerful stimulating effect upon these structures.

Heat is unquestionably a powerful vital stimulant. This appears to be true, however, only when it is applied directly to the tissues, as indirect effects produced through the thermic nerves by heat impressions upon the skin, produce a depressing effect. These depressing effects are well illustrated by the relaxing influence of a hot bath, which gives to this simple therapeutic means its well-known value as a means of mitigating the pain of biliary or renal colic. Every surgeon knows the value of the hot bath as a means of relaxing the abdominal muscles in cases of hernia.

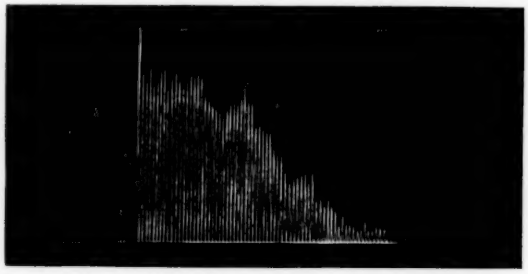
In experimental studies upon the effect of thermic impressions upon muscular activity, I found the capacity for work diminished by all forms of hot water baths. Hot packs, hot douches, hot immersion baths; all lowered the working power of the muscle to a marked degree. This is clearly shown by the accompanying ergograms and strength graphic.

In one observation, the subject, a young man 21 years of age, was given a hot spray bath at a temperature of 113° F. for fifteen minutes. An ergogram obtained by means of Mosso's ergograph, compared with an ergogram made before the bath showed a loss in the total amount of work done, of .652 kilogram meters, a reduction of 11 per cent.

In another case, a young man 21 years of age, weighing one hundred and forty pounds, whose strength graphic showed a total of 6,480 pounds, gave after a hot immersion bath at 112° F. for twelve minutes, a graph showing a total



Ergogram obtained by means of Mosso's Ergograph, showing normal fatigue curve of a young man, R. A. S. Total work, 4.994 kgm.



Ergogram showing fatigue curve of R. A. S. after a spray at 113° for fifteen minutes. Total work, 4.432 kgm.

strength of 5,415 pounds, a loss of 1,065 pounds, more than 16 per cent.

Another subject, a young man about 23 years of age, weighing one hundred and thirty-five pounds, was given a general arc light bath of eight minutes' duration. The skin surface was kept sufficiently cool to prevent perspiration. An ergogram made before the bath showed total work of 5.175 kgm. in one minute and forty-five seconds, or 2.960 kgm. per minute. After the light bath, an ergogram made immediately after the bath gave 6.567 kgm. in one minute and fifteen seconds, at the rate of 5.254 kgm. per minute, an increase in the total work done following the light bath, of 26.8 per cent, and of the work done per minute, 77 per cent.

My colleague, Dr. Paul Roth, has studied the effect of the general incandescent light bath upon metabolism, and has demonstrated an increase of forty to fifty per cent.

HEAT MAY BE STIMULATING OR DEPRESSING, ACCORDING TO THE MODE OF APPLICATION

McConnell and Yagloglon (1925), Plant and Wilbrand and others have shown an increase of metabolism resulting from exposure to hot air, accompanied by a rise in the internal temperature. DuBois (1921) noted in fever cases an increase of the metabolic rate following rise in the internal temperature. From many clinical observations, which I believe I shall soon be able to confirm by laboratory tests, I am convinced that sunlight and arc-light baths produce increases in the metabolic rate with less elevation of the general body temperature than do the hot immersion bath and other ordinary means of applying heat, because of less heating of the skin and less interference with heat elimination.

The remarkable muscle-building effect of sunbaths is never seen as the result of hot water or vapor baths. The debilitating and relaxing effect of daily hot bathing if continued for more than a short period, has long been recognized. In the popular bathing resorts of Europe, patients are seldom advised to continue hot baths for more than six weeks, but one may see at the establishment of Rollier and at Berck-Plage and similar establishments for sun treatment, scores of patients who have exposed their bodies daily to the sun for several hours during periods of two or three years and even longer, and with cumulative benefit.

THE SUPERIOR THERAPEUTIC VALUE OF LUMINOUS HEAT RAYS

I am fully convinced that too much emphasis has been laid upon the therapeutic value of the ultra violet rays, or rather that a more exclusive therapeutic value has been attributed to this region of the spectrum than properly belongs to it. For more than twenty-five years, I have been fully convinced that the luminous rays possess a high therapeutic value and that much of the benefit which has been attributed to the ultra-violet rays is really due to the vitalizing qualities of luminous heat waves. The great penetrating power of these rays enable them to pass through the skin almost as easily as through glass. They readily penetrate the tissues until they reach the blood-vessels, where they are intercepted and absorbed by the hemoglobin, elevating the temperature of the blood and thereby stimulating the activities of the

leucocytes and of other cells bathed by the superheated blood and lymph.

That luminous heat rays with the ultra violet rays excluded are a powerful vital stimulus, is clearly shown by the growth of plants before a window with ordinary glass, which excludes the ultra violet rays.

Many years ago Heile called attention to the fact that crabs soon die when painted with black varnish, but are wholly unaffected when covered with a transparent varnish. The influence of heat upon the activity of white cells, leucocytes, the amoeba and other mobile protozoa, is a phenomenon familiar to all biologists.

The short, luminous heat waves pass through the skin so readily that little absorption takes place, and the great part of the energy reaches the deeper tissues. The longer infra red heat rays, however, being wholly absorbed, the skin is quickly heated to the point of tolerance, limiting the dosage so that the amount of energy actually received by the body is considerably diminished. Stoves, steam pipes and other non-luminous sources of heat, give off only these long non-penetrating heat rays, the so-called outer, infra-red, and because of the overheating of the skin greatly restrict the amount of energy which can be made to reach the deeper tissues.

COOLING OF THE SKIN DURING THE APPLICATION OF PENETRATING HEAT RAYS

Rollier is able to expose his patients to the sun's rays for hours because they are in the open air and the skin is thus kept cool, while the highly penetrating, luminous rays carry to the deeper lying tissues a steady flood of vitalizing energy.

It is important to bear in mind the fact that the thermic stimulation of the deep lying tissues depends upon the penetrating power of the rays employed. Luminous heat rays pass as rapidly through a cold skin as through a heated skin.

Nearly thirty years ago I recognized the fact that the amount of light energy that can be introduced into the tissues is limited by the amount of heat which the skin will bear and to overcome this difficulty, resorted to cooling of the surface, first rubbing over it at frequent intervals a piece of ice, or quickly wiping it off with a sponge or cloth dipped in cold water. This method may be used in connection either with the arc light or the photophore. I have found this an extremely practical and useful measure.

Another very effective means of cooling is by the air blast. The fan is so placed that a strong current of air falls upon the surface to which the application is made. The cooling effect of the air current may be enhanced by occasionally moistening the surface with a sponge or a wet cloth so as to increase the elimination of heat by evaporation.

The electric fan may be used in connection with either the upright or the horizontal cabinet, or the standing cabinet. In the standing cabinet the fan is placed at the top so that the current of air strikes first upon the patient's head, the exit being at the bottom. A thermophore is placed under the patient's feet.

In the employment of these combined procedures, in which the skin surface of the patient is cooled during the bath, the cooling does not materially interfere with the application.

In an application of the carbon arc light to the skin of one side of the abdomen for four minutes, without the fan, the immediate effect was a very pronounced reddening of the surface. The patient experienced a very uncomfortable sensation of heat. The patient s position was then changed so as to allow the light to fall upon the opposite side, using the fan to cool the skin. The effect at the end of four minutes was very slight reddening of the surface and no discomfort from heat. The next day very pronounced solar erythema appeared on both sides alike. The skin was sensitive The effects were slightly more pronounced upon the side to which the air current had been applied in connection with the light.

By employing cooling measures so as to prevent overheating of the skin, the intensity of the light application may be greatly increased, and thus the effects upon the deep lying tissues may be very considerably enhanced.

This procedure combines the tonic or stimulating effects of cold and heat, while eliminating the depressant influence of both. Heat depresses through the inhibitory reflexes set up as the result of overheating of the cutaneous nerves.

Cold depresses by lowering the temperature of the blood. By the combination suggested, both of these depressing influences are eliminated, and the direct thermic stimulation of the deep structures produced by the deeply penetrating heat rays is combined with the powerful tonic reflex stimulation resulting from the cooling of the cutaneous nerves.

No possible combination of therapeutic forces could be happier than this.

By cooling the surface during a general light application, the range of application of the electric-light bath is very greatly increased, as it becomes possible to employ the bath in cases quite too feeble to react well to an application made in the ordinary way.

RUBNER'S INTERESTING DISCOVERY

An experiment made by Rubner more than thirty years ago, called attention to the fact that radiant heat from different sources may vary greatly in the physiologic and consequently in the therapeutic effects produced. In one experiment he compared the effects of the sun's rays with the heat emitted by an argand lamp. He found the highest degree of radiation from the argand burner that could be endured, was a rate of 0.3 calory per minute; whereas the sun's rays could be easily tolerated at the rate of 1.0 calory per minute. The reason for this difference is found in the fact that luminous rays constitute only three or four per cent of the light from the argand lamp, the balance being infra red; whereas luminous rays constitute fully one-third of the sunlight, or ten times as much as in the argand light.

Here are several highly important facts to be kept in mind: First, that the infra red or invisible heat rays in general are almost wholly absorbed by the skin. Only the so-called inner, "infra red rays," which occur in a narrowly limited region next the red of the spectrum, have any considerable penetrating power, as have the red and yellow luminous rays. Second, when tonic or restorative effects are desired, it is important that overheating of the skin should be avoided, and to accomplish this either sun heat in the open air or heat from the carbon arc, with the cooling of the skin, should be employed. Third, if, on the other hand, the depressing effects are desired, these are best secured by employing sources of light that are rich in infra-red or such ordinary sources of heat as the hot bath, the hot pack or the hot air or vapor bath.

Recent experiments by Sonne of Copenhagen confirm the belief that I have held for many years, that the chief therapeutic value of light, whatever its source, is due to heat rays rather than to the ultra violet rays. The ultra violet rays are destructive in character, as shown in their power to destroy bacteria. When applied with more than a very moderate degree of intensity, they destroy the superficial cells of the skin and give rise to an erythema closely akin to that produced by various toxic substances. Heat rays, on the other hand, act as a powerful, vital stimulus. They energize the cells and when applied with a proper degree of intensity produce no untoward effects.

Hill and others have shown that the reaction produced by an erythema dose of ultra violet rays produces temporary immunity which may, under some conditions, be highly advantageous, and it is known that the ultra violet rays, even when applied for a very short period, give rise to remarkable effects in curing rickets, by increasing the power of the body to utilize phosphorus and lime in bone-building and other processes. Ultra violet rays are also known to be valuable in combating tuberculosis, especially tubercular infections of the skin and bones; but these general therapeutic effects are greatly enhanced by the simultaneous application of ultra violet rays with the more penetrating luminous heat rays, as in the use of sunlight or the arc light.

Recent experiments by Sonne have shown that under radiation by luminous heat rays, the temperature of the subcutaneous tissue may be found to be two degrees higher than that of the surface of the skin; whereas, during radiation with infra red rays, the temperature of the subcutaneous tissues is three degrees lower than that at the surface.

Sonne is thoroughly convinced from his experiments that the highest therapeutic potency is in the visible heat rays. The infra-red rays, as he has shown, are for the most part, absorbed

by the superficial layers of the skin, and never reach the deeper tissues; whereas the visible heat rays penetrate deeply into the tissues.

One of the most common and certainly one of the most useful therapeutic uses of heat is for the relief of pain. It was for this purpose that I first employed radiant heat, being particularly impressed with its special adaptability to this purpose. I had previously made experiments which convinced me that the heat from such sources as fomentations, hot water bags, etc., penetrated the tissues very slowly and only very superficially.

THE APPLICATION OF HEAT TO RELIEVE PAIN

Just how heat relieves pain, no one has been able to explain fully. Possibly it acts by causing inhibition through the medium of the thermic nerves. For efficient service as an analgesic, the application should be made at a temperature of 120° to 140° F. The heat must be as great as the skin will tolerate without actual damage. The best results are obtained when the temperature of the application is such as to produce a sensation closely bordering on pain. Water may be used for such an application but hydriatic applications have the disadvantage that they begin to cool at once when applied, and so are highly efficient for only a few seconds. Radiant energy from a carbon arc light, an incandescent filament, or a heating element, supplies a constant stream of heat which may be easily increased of desired.

For treating painful skin lesions, itching or parasthesias, the incandescent heating element is best because of the great percentage of red and infra red rays which this source supplies. For the conditions named, heat applied in the manner indicated, is almost a panacea. It will afford complete relief from the intense itching and burning of eczema, acute or chronic dermatitis from whatever cause, urticaria, and other skin affections, within five minutes or less. The relief usually lasts for several hours. Repetitions of the application greatly facilitates recovery.

But for the deep-seated pains of sciatica, gastric and gallbladder pain, colitis and other visceral conditions, prolonged and very intense applications of heat are required. When failure occurs, it is very often the result of insufficient dosage. When applied in the usual manner, the dosage is far from being sufficient for efficient results. A massive dose of highest density possible without burning the skin, is required for relief of these deep-seated pains. As commonly employed, the very intense heat necessary for definite results is maintained for only a few seconds, the light application being necessarily adjusted so as to make the heat tolerable. By the intermittent method of application, the high dosage may be employed for one-third or one-half the entire period of application, thus multiplying the intensity and efficiency of the application many fold.

While fomentations, hot air, so-called "baking," and other applications of non-luminant heat are more or less useful as a means of relieving pain when efficiently used, the photophore is incomparably superior, not only because of the penetrating power of radiant heat, but because of its adaptability to the intermittent method of application. Heat from a fomentation penetrates the skin slowly; the rate of heat penetration by conduction decreasing, according to Goldscheider, in proportion to the square of the distance, or at the rate of an inch in thirty or forty minutes. It is indeed doubtful whether heat often penetrates by conduction to any considerable depth on account of the movement of blood in the blood-vessels. On the other hand, luminous heat rays reach the maximum depth in the tissues the moment the application begins. By intermittent cooling of the skin with a swinging fan, superficial applications of the highest intensity may be made. It it is desired to reach only the deepest structures, the surface may be continuously cooled by the electric fan, thus making possible the employment of doses two or thee times as great as would be possible without the cooling. Klar showed that by exposing the skin to cool air, the rate of heat elimination could be increased to five or ten times the ordinary amount.

Heat from incandescent sources is also preferable when analgesic effects are desired because of the absence of ultra violet rays, so that the applications may be made as long as may be found desirable and repeated as often as necessary.

In diathermy, we have not another agent, but simply another mode of applying electromagnetic energy in such a manner as to raise the temperature of the tissues.

Diathermy has the same advantage possessed by radiant heat in that it affords a means of heating deep-lying structures. Experiments have shown that the temperature of the stomach may be raised 3.6°F. by an antero-posterior application. With electrodes applied to the back and abdomen, the rectal temperature has been raised to 104° F., and with an electrode in the rectum, to 113° F. The temperature in the spinal canal has been raised to 103.5° F. With electrodes applied to the hands and feet, the rectal temperature may be raised 2° or 3° F.

The normal blood pressure is not materially affected by diathermy, but high pressure is lowered by a general application. Such an application causes an increase in the pulse rate and perspiration when continued an hour or more.

An application of diathermy made in such a way as to raise the general body temperature increases the metabolic rate.

These facts clearly show the high value of this agent in dealing with deep-seated disorders. As a means of applying heat to deep-lying structures, it has no rival and has acquired an established place in therapeutics for the management of disorders involving the stomach, gall-bladder, colon, spinal cord, the lungs, as in pneumonia, certain heat affections, and the various forms of neuritis and neuralgia and chronic rheumatism of the joints and muscles.

The best results from the use of diathermy are obtained by combining with it alternate or simultaneous applications of radiant heat both general and local.

In concluding this very incomplete and hurriedly written paper I desire to express my appreciation of the efforts being made by this association in behalf of physical therapy and to express the hope that through extended clinical observation and careful laboratory research, not only phototherapy, but every other form of physical therapy may be fully established upon a rational and scientific foundation. When I became interested in scientific physical therapy by my acquantance with the elder Dr. Austin Flint, under whom I was a private pupil, and Dr. George M. Beard, with whom I was a pupil assistant when he was inventing in neurasthenia, the use of water, electricity, massage and kindred means was looked upon as quackery. I heard Dr. Flint and Dr. Frank Hamilton, another of my teachers, ridiculed at the Academy of Medicine when they commended the use of water in fevers and the treatment of wounds. Dr. Beard was regarded by many as a near charlatan. I was convinced by Flint's teaching and the works of Currie, to which he introduced me, that there was a sound scientific basis for physical agents which might be found by research to determine their physiologic and therapeutic effects. For many years I have labored toward this end, but have been so greatly hampered by a heavy burden of professional and administrative duties that I have been able to carry out only a fraction of the research work which fifty years ago I planned to do. But the activity shown in recent years by physiologists the world over in the study of heat, light and electricity, the chief of our physical curative agents has raised physical therapy to the place of honor among human agencies which are capable of cooperating with the *vis medicatrix naturae* in the amelioration of human suffering.

PHYSICAL MEANS IN THE CORRECTION OF CERTAIN LOWER BACKACHES*

F. H. EWERHARDT, M. D.
Washington University
ST. LOUIS

In discussing the subject of lower backache I wish to make it clear that I do not intend to cover the entire field of lower back pathology and its treatment, and that the paper will be limited to conditions in which organic lesions are absent, or at least not demonstrable. Therefore arthritis, bone tuberculosis, fractures, dislocation, spondylolisthesis, tumors or radiating pain originating from renal, vas-deferens, pelvic or abdominal lesions will be left out of consideration. Our efforts will be directed more specifically towards discussing a condition which can not be included in any of the above mentioned diagnoses and which seems to defy a definite classification. This condition is now commonly termed static or chronic backache, which, though not a good scientific term is, nevertheless, expressive. Numerically speaking it is found in probably fifty per cent of all our lower back cases.

In the realm of kinesiology the term static is applied to a condition of being stationary as opposed to being in motion. That is to say a muscle is in a state of contraction, but retains its length during the work, becoming neither shorter nor longer. For example holding the arm at a 90 degrees abduction is considered a voluntary exercise and classified as static. The muscles involved soon tire and if the arm is held in this position to the absolute maximum time possible, the investigator will experience a real sense of pain in the region of the strained shoulder muscles; the result of an accumulation of fatigue matter or perhaps too prolonged stimulation of nerve endings in joints and tendons. If, on the other hand, the arm is raised and lowered, the muscles involved contracting and relaxing alternately, the act is considered a voluntary active exercise which can be executed over a greater period of time and with considerably more actual work performed.

*Read at the sixth annual meeting of the American College of Physical Therapy, Chicago, Nov. 3, 1927.

Man, by rising from the quadruped to the biped and from instinct to reason, concomitantly advanced himself from the lower strata of animal life to a higher civilized human race. By means of the upright position he has increased his field of vision, his freedom of hands and arms and with it a more highly specialized brain. This change of position has, however, not been without considerable disadvantage which reflects itself markedly on the efficiency and well-being of the individual.

The human body is an intricate, finely adjusted machine whose parts, under normal conditions, are closely correlated to operate with the least amount of energy. The top heavy trunk resting upon a relatively narrow base, must necessarily be well balanced in order to avoid constant and undue strain. This condition depends, so far as the body mechanism itself is concerned, mainly upon the proper position of the various parts as related to each other, and the correct functioning of the neuromuscular apparatus. In a perfectly poised standing position the various segments are so balanced that comparatively little effort is required to maintain it. If this normal position becomes disturbed, an unnatural strain will be imposed upon the muscles of the legs and back, fatigue will set in more readily and there will follow a lowering of tone and bodily efficiency. The correct attitude fosters full vigor and health, prevents waste of energy, inculcates confidence and assurance.

Let us consider some of the findings of these typically chronic backaches. The patient complains first of all of an almost constant dragging pain, more particularly in the lower back, less frequently in the mid-dorsal or upper. The patient may be perfectly comfortable in a sitting or lying position, but soon after taking a standing position or walking, the pain appears. We have had patients who described what they called a slipping of the vertebrae in the lower back,

pointing at the same time to the region of the sacro-iliac joint. Radiating pains down the posterior thigh, simulating sciatica, are not infrequent complications. Constipation is not unusual. The patient presents a typical picture of general bodily lassitude and an inability to perform the day's routine. The entire musculature feels fatigued and the patient acts and certainly looks tired. The facial expression is a picture of forlorn hope, for very often these patients have passed through several hands without relief and they are beginning to feel that their condition is hopeless.

Examination is negative with respect to organic lesions, although the x ray may show slight changes in the bodies of the vertebrae. We do not expect the x ray to show any separation of the sacro-iliac joint, except in the presence of a very severe injury in which state the case does not come under our present discussion. Occasionally the plate reflects congenital defects in the shape of lumbo-sacral anomalies which, when present, are generally found to be contributory, rather than the active cause and add but another element to a potentially weak back. The mobility of the spine is markedly limited in all directions, especially flexion and hyperextension. The patient bends in the various directions with obvious hesitancy, the movements being performed slowly, deliberately and with perceptible alertness as if expecting a sudden pain or "something to happen." On palpation one may find tenderness of a greater or less degree over certain segments of the spinal column, more especially the lumbar region and not uncommonly over the sites of the sacro-iliac joints. Looking at the patient from the posterior aspect one may notice one hip lower than the other, which may be due to a congenital condition of the hip girdle or a shortening of the leg on that side. If the shortening is less than one-half inch, the deficiency in length must not be regarded as conclusive evidence that it contributes much, if any, to the pathology of the lower back. Anthropometric figures tell us that in a large percentage of so called normal individuals, one leg is shorter than the other to the extent of one-fourth to one-half inch without in the least disturbing the happiness of the individual.

On viewing the patient laterally one finds what is frequently referred to as the fatigue faulty posture. The main points which strike the eye, are a protruding and relaxed abdominal wall, flat, depressed chest, drooping head, stooped shoulders, hollow back and bent knees. On asking the patient to rise on his toes, we notice that preliminary to the raising of the heels the body sways forward considerably, indicating too large a proportion of the body weight has been carried on the heels. In such a condition the patient invariably throws his hips forward and in front of the centre line of gravity. Concurrently the shoulders droop backward and the head sinks forward. The entire performance is an effort at readjustment to keep the body balanced in an upright attitude. This is a picture of bad body mechanics, a condition which requires an undue amount of nervous and muscular energy to maintain the erect position. This constant strain produces the dragging and nagging pain which brings the patient to the doctor for relief. Whether this ache, which is so strikingly similar to the situation which was described at the beginning of the paper in connection with abduction of the arm, is due to an accumulation of fatigue substance as suggested by some physiologists or to a constant stimulation of the nerves as other investigators believe to be the case, makes very little difference so far as treatment is concerned. The strained condition needs to be relieved by placing the various parts in better mechanical position.

Examination of the patient shows marked spasticity of the lower back muscles, the seat of the pain, and yet so frequently the patient is prepared for a vigorous campaign of exercise to strengthen muscles which supposedly are weak and the direct cause of the poor posture. This, of course, is erroneous. It is obviously wrong to stimulate to further violent contraction a muscle which already is in a state of hypertonicity. That muscle needs rest and relaxation. Furthermore, many cases of this type which we have seen were individuals with a powerful musculature, which suggests the fallacy of the theory that the incorrect body mechanics is primarily due to weakened muscles. We believe that many of these so-called faulty posture cases, the type which we are describing, are due primarily to

firmly embedded and long standing bad postural habits, which may be present in persons with either weak or strong skeleton muscles.

To be sure, weak, flabby atonic muscles are more often present than strong ones but that fact must not be considered, per se, as being the cause of the individual assuming a bad mechanical position. Rather let us state that weak muscles more easily allow deviation from the normal. The seat of trouble is in the poorly formed posture sense, which is a rather complex mechanism comprising muscle tone, as related to voluntary contraction; the matter of postural contraction; physiological lengthening of a group and shortening of its opponent. It also takes into consideration a discriminative appreciation of the spatial relationship which one part of the body bears to the other, and which manifests itself in the form of a mental picture, created, we are told, by afferent sensory impressions from muscles, tendons and joints. It will thus be understood that the strenth of a muscle or group of muscles bears but a part of the entire mechanism encompassed in the question of posture. We can also appreciate, therefore, that indiscriminate developmental exercises like leg raising, trunk bending, arm flinging and deep breathing may produce a strong group of muscles, and yet not correct faulty posture.

The essential factors embodied in the process of correcting bad bodily attitude are:

1. To relieve stretched, strained, overstimulated muscles and ligaments. This may be accomplished by placing the patient at complete rest, preferably in a non-sagging bed with the thighs slightly flexed and perhaps a small pillow in the hollow of the back. If possible the patient should be given deep heat therapy for a half hour daily with a cold application at about five minute intervals to enhance the effect of the heat. These should be followed by massage. If, however, it seems best for the patient to be about, the painful muscles may be partly immobilized by various mechanical devices. In pronounced cases of lordosis or pendulous and heavy abdomen, proper splinting is indicated. Depending upon the circumstances we choose either a reinforced corset, a steel brace with an abdominal apron or a removable celluloid jacket. Frequently, however, the wearing of these splints delays convalesance either because the indication does not demand such a procedure or because they are not properly fitted and, therefore, do not produce the desired results.

2. The patient must have a clear, comprehensive understanding of what is meant by incorrect and correct body mechanics. We have taken many patient's shadowgraphs who assumed a supposedly corrected position, either on their own initiative or as a result of a command. There pictures show conclusively the folly of expecting patients to take a normal posture, when they do not possess a clear conception of what constitutes normal posture. The teaching process can best be accomplished by the aid of shadowgraphs of the patient and a blackboard talk explaining in simple, understandable language the matter of body mechanics.

3. The patient must be taught how to assume and retain the new position.

4. Appropriate exercises should be prescribed and properly supervised and directed, the object being:

a. To increase the tone and strength of the muscle.

b. To lengthen one group and shorten its opposing group.

c. To arouse sensory impressions in muscles, tendons and articular surfaces which are transmitted to the conciousness of the individual, giving him a new mental picture of a new acquired postural sense.

I wish to reiterate what I said a moment ago, viz, (4) "appropriate exercises should be prescribed and then should be properly directed and supervised." Time and space do not permit a detailed account of this exercise program but I do wish to emphasize most emphatically that a so-called "daily dozen scheme" of exercises will not do the trick. They perform one function and one only, viz. to improve and strengthen the general musculature. For the purpose of shortening certain muscle groups, very definite localized muscle action is necessary which entails a careful study of muscle movements. An illustration of this brought to our attention by the frequency in which straight leg raising is

prescribed in cases of lordosis, for its supposedly selective action on the abdominal group. A close analysis shows that this exercise only secondarily brings the abdominal muscle in traction; it does not shorten it, but does on the other hand, still further strengthen and shorten the hip flexors, which latter condition we may assume to be a prime factor in the condition of lordosis. I, therefore, consider this exercise an improper one for use in the exercise treatment of lordosis.

Again for the purpose of creating a new posture sense a so-called "setting up" plan of exercises will not produce the desired result. For this purpose we choose a very definite type of exercise which is performed in a certain position, and sustained to the point of maximum effort.

There is another type of back ache without postural defects, the treatment of which demands a different procedure. This patient frequently is of a very unusually robust musculature, and yet complains of a constant backache. The x ray findings show a marked spastic condition of the back muscles. His spine is rigid and he is afraid to make more than a slight movement in any direction. Sometimes he wears a plaster or celluloid jacket or steel brace of some type or other. He also complains that on sudden movement he experiences a sensation of slipping in the lower back. Questioning reveals a condition of over treatment, both from the viewpoint of splints and exercise. Our method of treating this type is quite different from that mentioned above. Here we have marked spasticity of unusually strong muscles, but with definite incoordination, and our problem is to bring about a relaxation of the spasticity, and a readjustment and harmonious action of the various muscle groups comprising the hip girdle. It is our belief that the pain which the patient complains of is to a large extent caused by sudden stretching of hypertonic muscles, as e.g., in the act of bending forward from a standing position. Normally these erector spinal muscles relax because of inhibitory impulses and in consequence the body bends forward naturally and without pain. Following an injury, however, or as a consequence of muscle strain, this neuro-muscular apparatus has been disturbed and coordinated action between opposing muscle groups does not take place.

In such a condition it is obviously incorrect therapy to prescribe vigorous exercises entailing these hip group muscles. And yet it is being done over and over again on the theory that the muscles of the back are weak and therefore need strengthening. What they really need is relaxation and reeducation.

In the course of treatment the patient is subjected to a thorough heating of the muscles, either by means of diathermy, infra red or the radiant heat, a Scotch Douche (the application of alternately spraying hot and cold water against the back of the patient), and a good massage. This is followed by a scheme of slow rhythmical movements, entailing particularly the trunk muscles. These are progressivlely arranged from the simple to the more complex. Here the desideratum is not to increase, strengthen or tone the muscles, for as has been stated, they are already of unusual strength and tone. We strive instead to bring about a relaxation of these muscles and, what is of equal importance, a proper coordination so that the patient, when making a movement without previous deliberation, will not find his muscles in a state of unpreparedness. An example of such an exercise is the taking by the patient of a stride position, bending slightly forward and swinging, rather than raising his arms, to and fro by means of the trunk muscles. It is essential that the patient be told the motive governing the exercise; that it is not an attempt to raise the arms shoulder high by means of the shoulder muscles, but that the arms should be relaxed and flung, much as a pendulum swings from side to side. We ask our patients to imagine, for the moment, that the arms are disarticulated at the shoulder, but tied to it by means of a rope, thus eliminating all possible muscular contraction of the shoulder muscles. The problem then is to so manipulate his trunk as to throw his arms shoulder high. The result is a smooth, rhythmical lateral motion of the body, swaying from right to left, with arm flinging in the direction of the lateral trunk motion.

The essential points which this paper aims to indicate are:

1. That the pain incident to chronic or static backache is due, to a greater or lesser extent, to strain, stress and overstimulation of muscles and ligaments comprising the hip girdle.

2. That this condition is primarily due to incorrect body mechanics, reflecting itself particularly in the lower back; and that it can be traced directly to the kinetic sense apparatus in muscles, tendons and articular surfaces of the entire body.

3. That weak muscles, per se, are not necessarily the cause of this condition, but rather that they more readily allow it to happen. There are so many individuals with markedly poor posture, but who have an unusually strong system of muscles.

4. That physical agents like heat, hydriatics, exercise, massage and splinting are probably the most valuable means of therapy at our command.

DISCUSSION

DR. FRANK H. WALKE (Shreveport, La.): In my role I have been more prone to believe that these sacro-iliac conditions are not so much postural at first as injury, sacro-iliac strain. In my own series of cases of sacro-iliac conditions, I have noticed that the strain is first. Afterwards the patient assumes a position which has a tendency to lessen the discomfort. Later they are likely to develop all kinds of postural conditions.

Back strains or backaches are treated according to the etiology. Many are traumatic, from lifting or wrenching. Some are of five or six months' duration. The treatment will depend entirely upon the individual factors.

My particular treatment for the acute cases is infra red and strapping. There is a great art in putting on a strap properly. It must be done so that it will give a certain amount of motion. I don't think it supports anything, but it does limit the motion. For that reason, a strap properly applied should come far beyond the anterior spines and go all the way around, holding the pelvic girdle down as far as is possible so that the motion is limited rather than supported.

In cases of prolonged sacro-iliac conditions and backache in which there is a fibrosis, I do not know of anything better than negative galvanism over the site of pain so as to soften the tissue. I use diathermy first, negative galvanism next, and then a rapid sine current; on those that prefer Morse, use cam 1, so as to give a cellular massage which offers a certain amount of nutrition to the part.

In doing some dissection on the sacro-iliac region I have found that it is not so much muscles as ligaments that give the most trouble.

In cases of long standing I have advised a simple belt, about three strands' width of truss elastic, which fits right around the girdle.

I appreciate Dr. Ewerhardt's series of cases are purely postural. The work of the housewife is such that she has to stoop in all sorts of positions, making up beds and moving the piano and all those things; she constantly has her muscles in a strain; then she develops spasticity of the muscles.

The correction of posture is a wonderful thing. There are very few people who actually stand correctly. I say that advisedly. There is not ten per cent of people taken collectively who have the proper stance. It is a great thing to educate people how to stand.

DR. H. E. STEWART (New Haven): It seems to me that very few physicians, unless they have come into this field through physical education, have much of an idea of the importance of body mechanics. I think we owe Dr. Ewerhardt a great deal of gratitude for making clear this important subject.

He spoke of faulty posture as increasing fatigue, and the fatigue handicap of an individual. The reverse is equally true. Whenever a body is subnormal because of too rapid growth or the toxins of organic or acute disease, then the posture fails and a vicious circle ensues. We see that very often in the adolescent child. The muscles that maintain the upright posture are not in power balance. For instance, if we assign to the strong pectoral groups a numerical value of 50 and to the upper back group that retract the shoulders, 40, that relative advantage is not very great, you see, when we are alert, vigorous, and in good health. But let some disease, some condition of malnutrition, come along and take away 30 points of each of these groups, and then we have the fraction 20/10, which is quite different from 50/40. That is why a patient slumps toward the pull of the stronger group whenever he is below par.

Besides the important factors that Dr. Ewerhardt spoke of, re-education of the muscle sense, stretching and relaxing the contracting group, and selectively strengthening the physiological opponents, we have also the factor of joint flexibility, for in all postural deficiencies the surrounding joints are more or less limited in their position.

We have particularly the factor that I have just tried to indicate, that is to bring the patient up to the greatest postural amount of general vigor.

Think for a moment of the program of the average 13 or 14-year-old adolescent high school pupil—three or four societies and one or two athletics and a half dozen music lessons, besides study at home and the dances and so on. Think of the program that those average children are standing up under—a heavier one than many of us could carry. To add corrective exercise to that without a study of that program and eliminating some of the many non-essentials that it contains first would be foolish. In fact, many quite serious or severe postural defects in youth will disap-

pear if the child is simply taken away from this crushing burden of a day too full of non-essentials and, as we might say, simply put out to pasture, nutrition increased, rest particularly provided for, and wholesome exercise.

We have not had in our series of cases quite the proportion of what we thought were static cases as the speaker had, but we have had a large proportion, and of them and their treatment almost nothing is known along the line that has been indicated by him.

DR. F. H. EWERHARDT (closing): I wish to express my appreciation for the discussion. Dr. Walke, I think, brought out a very valuable point when he said that these postures that I have been talking about have their inceptions as the result of a strain or an injury. That is the acute condition. The acute condition often is the thing which causes the patient to take a slumped position and keep it. That finally becomes chronic, and that is what I was talking about.

I should also like to point out what Dr. Stewart said with regard to the relative strength of the muscles on the one side in the chest, and the back on the other side. Many college students have said, when I have examined them, "I have no pain, I am strong. Why should I worry?" The point is that the time will come when they will worry.

RESULTS IN COMBINED SURGERY AND X RAY TREATMENT IN CANCER OF THE BREAST*

ROSWELL T. PETTIT, M. D.
OTTAWA, ILLINOIS

Cancer occurs more frequently in the breast than in any other location except the uterus in the female. The breast is readily examined, is removable under light anaesthesia with little surgical shock and very low operative mortality, and yet with surgical treatment even the radical operation, there is at present over sixty per cent mortality. Why? Because the majority of cases reach the surgeon too late. With early diagnosis and early operation this high mortality should be and can be materially reduced. This means that the education of the public, particularly women, will be one of the most important factors in reducing this high mortality of cancer in a readily accessible region of the body.

The surgical difficulty is in getting all of the cancerous growth including the invaded lymphatics. If any cancer cells are left they will grow and a recurrence occurs. Cleaning out the axilla completely is an extremely difficult matter and surgical invasion of the mediastinum is impossible. Therefore successful surgery means early diagnosis and early operation before invasion of the lymphatics has taken place. If operation is delayed until the axillary nodes are involved it means that successful surgery is almost impossible.

Until the time comes when every woman, with a lump in the breast, consults her doctor immediately, and every doctor insists upon early operation instead of pursuing a policy of watchful waiting, is there anything further that can be done for these patients? Yes. Supplemental radiation—radium and x ray—and in view of the fact that in more than 90 per cent of the cases of cancer of the breast the axillary nodes are already invaded by the time the patient comes to operation, we cannot expect surgery to do it all, but must use these valuable adjuncts.

It has been known for a long time, almost since the time of the discovery of x rays, that cancer cells are susceptible to radiation if the cancer cells are accessible, such as in cancer of the lip. The difficulty has been to get x rays of sufficient penetration to reach the deeper tissues and affect cancer cells beneath the surface.

Radium has been of little value in breast cancer in most instances because the areas involved are so great and usually the amount of radium available is too small. However, with the development of greater volumes of more penetrating x rays, radiation treatment of breast cancer has been made possible and practical. Statistics are now becoming available that show conclusively that the combined surgical and radiation treatment produces a higher percentage of permanent results than surgical treatment alone. Even in cases with recurrence, life may

be prolonged as much as several years by the use of radiation.

In the case of cancer of the breast, the breast itself, because of its location, can usually be removed surgically with an extremely low mortality. The axilla principally and the chest wall secondarily and the supra clavicular fossae thirdly are the areas that demand effective radiation. Because of the irregular contour of the chest wall and the wide dissemination of cancer cells, chiefly to the axilla, uniform radiation is a difficult and individual problem. Radiation without carefully planned and individualized dosage is worse than careless and sloppy surgery.

The results achieved depend not only upon the machine but much more upon the skill and judgment of the one operating the machine. The skill and training necessary for successful radiation of the proper areas to be radiated is as great as that required for successful surgery.

In Table No. 1 the life history of cancer of the breast, gathered from many sources, reveals the fact that the life expectancy is on an average of thirty-four months.

The surgical curability of cancer of the breast as compiled from the literature gathered from many sources, Table No. 2, reveals the fact that at the end of three years with surgery alone only 38.6 per cent of the cases operated upon may be expected to be alive. At the end of a five year period these same statistics reveal the fact that only 28.8 per cent of the cases may reasonably be expected to be alive. Surely this is not a remarkable showing for surgery alone in view of the fact that the natural duration of cancer of the breast without operation (Table No. 1) is thirty-four months or practically a three year period.

The results of operation plus radiation of breast cancer, as shown by the tables of Perthes gathered from many sources (Table No. 3), reveals the fact that while non-irradiated cases or insufficiently radiated cases following a three-year period show a survival of 34.7 per cent to 35.5 per cent, in cases in which sufficient radiation has been used the three year survival period is 47 per cent. or practically 33 per cent better results with radiation than without.

In some of the clinics where the best radiation is practiced results as high as 60 to 77 per cent are reported. In my own experience of 86 cases treated more than three years I can report 62 per cent free from symptoms.

Frequently statistics are presented by various surgeons and clinics in this country and Europe in which cases are classified as "operable" and "inoperable" which are extremely confusing and unconvincing. Since such a classification depends solely upon the personal judgment and experience of the individual surgeon as to what is "operable" and "inoperable" a wide variation is, of necessity, the result. The consensus of opinion today I believe, however, among the best surgeons is that no case can be considered an operable case that has demonstrable metastasis in the axilla, and since it has been shown that full ninety per cent of the cases of cancer of the breast, that come to operation, have metastasis in the axillary nodes, the "operable" group must be extremely small. Are we to dismiss all cases with glandular metastasis and say that nothing can be done for them? Certainly not.

I have satisfied myself after six years' experience with the combined use of surgery and x ray and radium that many of these cases with axillary involvement can be materially benefitted and many of them survive the five year period. With more extended experience, particularly during the past few years, I have become convinced that extremely radical surgery, with wide dissections in the axilla for the purpose of removal of carcinomatous glands, is unwise and may frequently do more harm than good; that the cancerous process by the radical surgical procedure may be more widely spread and the unfortunate patient left with an intractable neuritis, edema of the arm and protracted suffering. The better plan, as demonstrated in my own practice, has been a wide dissection of the breast up to the lower axilla and dependence placed upon penetrating x rays over the chest wall, the axilla, and the supra clavicular areas (whether glands may be felt or not) with supplemental radium applications in the axilla and supraclavicular spaces to take care of any malignant cells not removed surgically. If the case

TABLE NO. 1

NATURAL DURATION OF CANCER OF BREAST

(Compiled from the Literature)

	Average
Lazarus-Barlow and Leeming	36 months
Paget	48 months
De Kop	29 months
Sprengel	27 months
Sibley, Baker, Giss, Williams	34 months
Lee	40 months
Rodman	30 months
Haggard & Douglass	26 months
Averages	34 months

TABLE NO. 2

SURGICAL CURABILITY OF CANCER OF THE BREAST

(Compiled from the Literature)

	Survival Period 3 year—%.	5 year—%
Walther, 1900-1910	32.0	.....
1910-1921	34.9	.....
Deaver and McFarland	34.0	26.0
Warren, 1904	33.0	.....
Halstead, 1907	38.3	28.9
Steinthal	33.6	33.3
Willy Meyer, 1905	35.8	.....
Schwarzkopf, 1895-1910	29.4	21.0
1904-1911	42.9	.....
Smith, 1911	43.0	17.0
Judd	44.7	39.8
Greenough	28.7	22.9
Bauchman	38.9	23.5
Deelman	.....	30.6
Brostrum	29.2	23.0
Gassmayer	37.7	20.3
Rostock Clinic	32.7	.....
Bier Clinic	33.0	.....
Schloffer Clinic	44.3	.....
Boss Clinic	53.0	.....
Rahm	27.5	15.9
Lehmann	32.0	28.0
Iselin	48.8	36.4
Forgue	44.0	22.0
Perthes	38.5	27.7
Tichy	38.7	20.9
Handley	48.9	.....
Hoffman	36.3	28.5
Peck and White	40.0	39.1
Neber	37.5	21.0
Lindenberg	42.1	31.4
Mills	49.2	36.8
Primrose	.....	44.4
Watson Cheyne	54.5	52.1
Average	38.6	28.8

TABLE NO. 3

RESULTS OF POST-OPERATIVE RADIATION OF BREAST CANCER (GROUPS OF PERTHES)

(Compiled from the Literature)

	Not Radiated. Cure 3 yrs.—%	Insufficient Radiation. Cure 3 yrs.—%	Sufficient Mod. Heavy Radiation. Cure 3 yrs.—%
Rahm	27.5	.....	30.0
Lehmann	32.0	.....	55.0
Kastner	.....	.....	36.0
Forssell	.....	.....	60.0
Hoffman (Heidelberg)	.....	.....	30.5
Mayburg (Tichy)	38.7	37.7	.....
Turbengen	.....	30.5	38.5
Rostock	32.7	.....	47.5
Loosen (Frankfort)	.....	36.0	41.0
Walther	32.0	.....	77.0
Anschutz	48.8	.....	60.0
Linder	.....	.....	43.0
Average	35.3	34.7	47.1

is an "operable" one, in the restricted sense, the chances of complete cure are just as great as before; if the patient is an "inoperable" one she will be given just as long or longer lease of life with very much greater comfort and freedom from pain.

I realize that this is a backward step from the accepted notion that the radical Halsted operation is the correct surgical procedure in all cases, but I am of the opinion that with improved methods of radiation in the next few years my more conservative position will come to be the accepted one.

Dr. U. V. Portman of the Cleveland Clinic, Cleveland, Ohio, says "It is not always possible to classify each case before operation, since it it not always possible to determine the extent of glandular metastasis particularly in obese individuals. However, we may consider the axillary lymph nodes potentially involved in every case and only careful microscopic examination can prove them to be free. According to eminent pathologists demonstrable evidence of axillary involvement is lacking in less than five per cent of the cases. In our own series of 1015 cases less than four per cent are free from metastasis."

Surgery has seen many changes and improvements in technique until now the technique has become quite standardized. However, the introduction of the electric cutting current will undoubtedly make changes and improve the

statistics of purely surgical procedures in cancer of the breast. The scalpel opens blood-vessels and lymphatics, the hemostat crushes and devitalizes tissue. The electric scalpel makes just as sharp a cut and in the process seals lymphatics and blood vessels and with the use of this apparatus the tissue crushing hemostat is practically eliminated.

With regard to radiation it must be remembered that x rays and radium were discovered only a little over thirty years ago and that radiation technic as well as surgery has undergone and is undergoing many changes and improvements.

With more accurate studies of the physical and biological laws concerned in the use of x rays and with increased experience in the application improvement is bound to follow. The therapeutic value of these important adjuncts to surgery—x rays, radium and electrocoagulation—has been proven. Experience and skill in their application is just as necessary as skill and experience in the use of the scalpel and sutures, and with proper co-ordination of all these methods there will most certainly be better and better results. The most important thing, however, is the education of the general public to seek medical advice early; to educate the profession to institute proper treatment at the earliest possible moment. Instead of 38.8 per cent survival at the end of three years I do not believe it is unreasonable to expect that the next ten years will show double the number of survivals.

THE STATUS OF PHYSICAL THERAPY IN THE TREATMENT OF OBESITY*

MAXIMILIAN KERN, M.D.
CHICAGO, ILLINOIS

A disturbance in the body weight clearly indicates a corresponding disturbance of the balance between energy intake and energy output.

Energy intake, it must be understood, cannot be measured simply by what goes into the body by the mouth; but it represents that part of the actual intake which is absorbed from any external source and made use of. There are clinical examples of individuals who apparently consume great quantities of food rich in energy; yet, such individuals, because of disease, gain little weight. Conversely, some individuals consume strikingly little food but appear to gain weight and become obese out of all proportion to the small amount of energy intake. The first and most important principle must be held clearly in mind in any treatment of obesity becomes at once apparent. When any person gains weight in excess of what can be considered physiologically normal, all factors such as stature, age, sex and the like being duly considered, that person is distinctly in a pathologic state. Obesity, in short, is a symptom of some definite disease.

As ordinarily considered, obesity refers to that pathology which is expressed clinically by varying amounts of abnormal fat deposit. That the fat itself is abnormal, as distinguished from the more or less normal fat pads which nature has supplied for protective purposes, will become apparent later in the discussion.

In general, the contributing factors which predispose to pathologic accumulation of fat may be grouped into three classical categories:—

1. Exogenous factors.
2. Endogenous factors.
3. Constitutional factors.

As the names suggest, exogenous causes are thought to be those which are related to gluttony and are typified by excess in the quantity of food consumed, and by the improper selection in the quality of food taken. This includes food taken in excess of that which can be used up by work or exercise. I suggest, however, that the so-called exogenous classification is in need of further inquiry and perhaps reclassification; for it is usually not enough to think that the entire pathology resides in overeating. The body is

*Presented before the Clinical Congress and sixth annual meeting, American College of Physical Therapy, Chicago, Nov. 3, 1927. The author is indebted to Dr. A. J. Pacini for several of the experiments mentioned in this paper.

particularly well provided with mechanisms which counteract, very largely, any short-sustained indiscretions. And if the indiscretions are long sustained, they are then fully capable of imposing the necessary pathological variations which lend to fat accumulation.

The endogenous type of obesity is usually identified with disturbances of the endocrine system.

The constitutional type is, in my opinion, as ill-defined as the exogenous; but it refers to the individual that becomes fat apparently regardless of whatever measures are instituted in the prevention of the condition, and seemingly because it has been the nature of the preceding generations to show the same predisposition. This word "constitutional" is a convenient term which has come down to us from the past and is used now as blanket term to explain something which is not clear to us. There must be some pathogenetic factor for every kind of obesity and in this so-called constitutional there must be an underlying cause.

Although these classifications seem to satisfy clinical requirements; yet there is a common endogenous factor to all three. Whether a person eats too much or too unwisely; or whether that person shows a familial tendency to become fat; or whether that person develops an endocrine imbalance which permits of fat accumulation, it seems to me that in all instances, obesity cannot appear unless there is first a definitely established impairment on the part of the normal physiology which permits the abnormal fat deposits to gather. Basically then, obesity subscribed to by any of the three conventional factors which admittedly predispose to its occurrence, is finally a disorder involving improper or inadequate metabolism of fat associated with the deposition of probably abnormal fat. In this sense, the pristine cause of obesity is in all cases endogenous. It is some basic disorder affecting the process of metabolism either directly or indirectly.

If the point has been stressed somewhat, it has been done with a single intent; that of emphasizing a clinical truth. No case of obesity, I submit, can be permanently cured by any measure, physical or otherwise, which does not first have some effort and success directed against this basic pathology. In my clinical experience, suppression in the quantity and choice of diet has more often than not resulted in the superimposition of a second pathologic syndrome on an already existing pathology, the superimposition of starvation on obesity. Until some form of treatment has been instituted which has for its object the annihilation of the cause resulting in fat accumulation, all measures are merely temporizing which at best act symptomatically and transiently.

I wish now to develop the theme of abnormal fat as a working hypothesis. Like all hypotheses, I have accepted this one simply on the merits which it seems to offer as a clinical expedient; and if the future should disclose the assumptious to be false and better replaced by others, the hypothesis shall at least have had the merit of pointing the way to surer foundations; but the facts will not have changed.

The mere disposition of weight due to fat cannot be considered of pathological origin. It has, in my belief, physiologic antecedent. Hibernating animals show the periodic accumulation of fat as a seasonal trait. Curiously enough, they show the seasonal accumulation of fat at a time when their total food intake definitely diminishes; and still more curiously, they show a diminution in the fat during a foodless interval. To illustrate specifically, we shall consider the frog. When the fall of the year approaches, the frog consumes less and less food; but it becomes fatter and fatter as it enters its hibernating stage. During hibernation, the frog remains at first constant in its weight, but later it shows a loss. Finally, at the spring season, it reduces to normal and emerges from its state of hibernation to carry on the affairs of its life for the new season.

There are several interesting facts that are not wholly without significance in this physiologic routine, for which routine the frog furnishes but a single example. In the first place, the changes in fat deposition and fat resorption are regulated according to the seasons, and since we have come to learn that seasonal fluctuations in the environment are intimately co-related with such diseases as rickets, apparently because of the fluctuations in the amount and kind of

environment ultra violet, the thought impressed itself upon me that perhaps a similar mechanism was involved in the fat metabolism of the frog. To this point I shall make reference again later.

Suppose we extend the hibernating syndrome to the human subject; we seem to discover a similar tendency which serves as an analogy and which presages the hibernating vestige, and that it is worthy of some slight experimentation and investigation.

Some experiments which I directed last fall and this spring are interesting, even though they are incomplete and may require repeated substantiation. Acting on the supposition that the same factor which appears to govern the rickets incident could likewise be responsible for the hibernating phases, I caused hibernating frogs to be exposed to ultra violet radiation. Such frogs instantly lost weight and emerged from their state of hibernation.

This experiment is not without a human analogy for it is definitely well known among users of ultra violet radiation, particularly those engaged in pediatrics, that overexposure to ultra violet radiation or too frequent exposure to ultra violet radiation, is usually accompanied by a loss in excess weight. Of course manifestly it is not the ultra violet irradiation per se but some internal effect of it which produces the change. The ultra violet irradiation must affect some physiologic process.

Whereas my experiments are only begun, and I draw incompletely from a few scattered observations, the impressions I have thus far gained have prompted other lines of inquiry. I wish to mention a single additional postulate.

The fats which are deposited physiologically differ from those which are deposited pathologically. I have been informed that hogs deposit lard when forced-fed; but such lard, although apparently similar in chemical composition to usual lard, is strikingly deficient in vitamin content. But hogs that fatten without exogenic stimulus show a lard containing vitamin, though at no time in excess.

Apparently, what is known about the fat of adipose tissue is best summarized by Leathes and Raper (Monographs on Biochemistry; The Fats 1925). I am obliged to make a lengthy quotation to avoid any possibility of misstatements.

"In mammals, adipose tissue forms the chief store of reserve fat, but in the lower animals fat may be stored in other regions such as the liver or muscles or special glands. Adipose tissue contains from 88 to 93 per cent of fat, the amount varying slightly with the species. The fat consists almost entirely of triglycerides, and may be taken to be made up partly of the fat that has been synthesised by the animal from substances of a different nature, and partly of fat which has been taken as food in excess of its requirements. * * * Ledefeff (1882), for instance, starved two dogs until almost the whole of their reserve fat had been used up, and then fed one on linseed oil, and the other on mutton fat. After a time the dogs were killed, and the melting point of their adipose tissue fat determined. The dog that had received linseed oil contained adipose tissue fat with a much lower melting point (it was liquid at 0° C.) than that of normal dogs, whereas the dog that had received mutton fat gave a melting point higher than normal, above 50° C. The melting point of the connective tissue fat thus tended to approach that of the fat contained in the food. * * In this way Winternitz (1898) has obtained a storage of so-called iodised fat, i. e. unsaturated fat that has had its unsaturated linkages saturated by treatment with iodine, and Munk (1884, has succeeded in getting a deposition of erucin (the triglyceride of erunic acid, C_{22} H_{42} O_2) on feeding a dog with grape seed oil. * * * Henriques and Hansen (1901) have carried out experiments which bear upon this point, and which indicate the great effect of the fat in the food on the kind of connective tissue fat which is laid down. Two pigs were fed on different cereals, one on barley, the other on maize. The fat from the animal fed on barley had an iodine value of 57.7 and a melting point of 27.4°, that from the one fed on maize had an iodine value of 75.6 and melting point of 23°. These differences correspond to differences in the same constants of barley fat and maize fat respectively. * * *"

It is common knowledge that the fat which lies just under the skin has a lower melting point than that found more internally. These differences in melting point are associated with

corresponding differences in iodine value. The lower melting fats have a higher iodine value, and therefore contain a greater proportion of unsaturated fats. Henriques and Hansen (1901) have investigated this phenomenon and have shown that there is a regular gradation in iodine value in a downward direction as the melting point of the adipose tissue fat increases. Even in the subcutaneous fat of the pig these gradations can be observed as one passes inwards from the outermost layers. The following figures given by Henriques and Hansen for a pig fed on barley illustrate this:

Source of Fat			*Iodine Value.*	*Solidifying Pt.*
Subcutaneous Fatty Tissue	Outer half	Outer layer	60.0	.....
		Inner layer	57.1	26.4°
	Inner half	Outer layer	51.8	28.0°
		Inner layer	50.6	27.7°
Perirenal fat			47.7	29.6°
Omental fat			46.5	29.4°

Jaeckle (1902) has examined the subcutaneous fat from new-born infants and compared it with adults. From an infant three days old the iodine value was 47.0; from others two or three weeks old, 58.1; and from adults, 62 to 73. The fat of the new born infant has also a higher melting point than that of adults, and this is no doubt to be correlated with the internal situation of the foetus. Henriques and Hansen attribute these differences in composition to differences in temperature of the regions where the fat is laid down. They determined the temperature of the subcutaneous tissue in a pig at different depths from the surface, and found that 1 cm. deep it was 33.7°, at 2 cm. 34.8°, 3 cm. 37.0° and 4 cm. 39.0°. The rectal temperature was 39.9°. * * * Now it is generally held that the cells of adipose tissue do not synthesize from substances, such as protein or carbohydrate, the fat which they store up, but rather that they take up this fat from the blood stream. In what form it is taken up, whether as neutral fat, fatty acid or soap is uncertain, but the process seems to be one which favours the storage at lower temperatures of the more unsaturated fats. * * * It is possible, for instance, that the permeability of the adipose tissue cell to neutral fat, fatty acid or soap varies with the temperature, and that at lower temperatures it is permeable to the unsaturated fats, fatty acids or soaps than to the saturated ones. An adequate explanation based on experimental evidence is, however, still wanting, but it does not appear unlikely that it will be found in an unequal variation with temperature of some property common to the saturated and unsaturated fats, fatty acids or soaps."

In this work I was impressed with the relation which fat holds to iodine, as discussed by Winternitz. It is definitely known that unsaturated fats, owing to their unsaturated linkages, can add iodine. The problem naturally propounded itself as to whether thyroid gland activity with its iodized secretion held any relation to fat metabolism. A few incomplete experiments developed some curious and significant possibilities. The fat obtained from hypothyroid individuals (who are usually lean) was found to show a generally high absorption number, thus indicating that such fat is relatively unsaturated; whereas the fat obtained from obese individuals associated with hyperthyroidism was generally found to have a low iodine absorption number, thus indicating a relative saturation. It would seem that saturated fat offers greater difficulty in entering into chemical metabolic relationship with the physiologic processes of the body than does unsaturated fat; and it would seem further that iodine can probably act as a determinant which has it in its power to check or to promote the ability of fat to become metabolized.

The continuation of this line of inquiry indicated that exposure of the body to ultra violet radiation resulted in a large degree of saturation of the fatty acids of adipose tissue. It is not known to me whether ultra violet irradiation acts immediately upon the fat to discharge its saturation and thus render it metabolizable, or whether ultra violet increases the endocrine activity so as to permit the fat to be attacked from endogenous sources.

Owing to the rather complicated nature of the problem, it is impossible at this time to offer any final results; I wish it to be understood that I am hypothecating merely on the basis of the results of experiments which have thus far been conducted under my direction. It is hoped that at the proper time, I shall be able to contribute in full the details of these experimental inquiries.

On the basis of these considerations, we may now inquire into the part played by physical therapy in the treatment of obesity.

Various modifications of electrical stimulation designed to bring about vigorous muscle contraction have been recommended from time to time. Such methods depend for their assumed action on the "burning" of the fat which is deposited in the neighborhood of the contracting muscles. In short, the method is a form of passive exercise, apparently indicated where an individual, owing to various complications, cannot indulge in vehement exercise on his own accord. The best testimony to the ubiquitous failure of this method of treatment lies in the fact that even its heartiest endorsers have virtually abandoned it. The reason is not difficult to see; it does not change the underlying condition which permitted fat to accumulate in the first place.

Diathermy has been used on the fanciful assumption that it passes through the body and it stimulates the tissues which in its assumed path are subjected to its hypothetical heating. I wish to emphasize that there is no proof anywhere available definitely indicating that high frequency currents pass through the tissues; on the contrary, all evidence thus far presented establishes an opposite view. But aside from these considerations, the clinical fact remains that I have seldom observed any measurable evidence of fat reduction in consequence of the treatment by the so-called "diathermy."

Methods which are conducive to profound perspiration definitely produce loss in weight; such as for example light baths and the like. Careful inquiry reveals that the loss of weight is incident to the loss in water, and that the fat deposit is little modified.

From these glaring failures, the above mentioned physical agents have, in my judgement, no status in the treatment of obesity. By that I mean that the so-called physical agents mentioned are without appreciable clinical effect. But physical therapy in the form of ultra violet radiation offers a probable future in the scientific treatment of this condition. I have briefly indicated the relations that ultra violet radiation can apparently hold with obesity; but owing to lack of any definite evaluation of the mechanisms involved, it is possible only to indicate that the subject requires thoughtful consideration and carefully controlled experiments.

It seems fitting to conclude with the summary of the salient developments which seem to me promising:

1. All forms of obesity appear to show the common factor of metabolic perversion, upon which such predisposing factors as exogenous, endogenous and the so-called constitutional aberrations, can develop aggravated pathology.

2. In consonance with the above theme, all forms of obesity must be looked upon as representing definite disease requiring critical internal medical judgment and study.

3. Some studies have been suggested in which fat metabolism and its relation to saturation and unsaturation takes on a new aspect; and the apparent relation between the regulation of this metabolism with ultra violet radiation and the natural hibernating vestige is briefly suggested.

4. In general, sinusoidal and similar electrical stimuli are at most only symptomatic therapeutic measures, and can offer only transient relief, even if vigorously persisted in. High frequency currents are apparently without effect in the treatment of obesity. These measures, in so far as they represent physical therapeutic modes, leave that form of therapy without status in the treatment of this condition.

5. In physical therapy, ultra violet radiation alone offers some degree of hope in the clinical treatment of obesity.

1549 Pittsfield Building.

DISCUSSION

Dr. J. H. Hutton (Chicago): It was some satisfaction to learn that there were two viewpoints at least regarding obesity because nearly every time a meeting of some sort is held in Chicago somebody breaks into print with something on obesity. We now have

recognition of the fact that there are at least two kinds of obesity, the endogenous or the exogenous. It seems, of these two classes, the endogenous is probably the endocrine disfunction that Dr. Kern stressed. I doubt if the endocrine variety is always a congenital affair.

Sometimes a young person will go along until he has measles and then take on a lot of weight, which is probably a pituitary type. It isn't unusual to see the same thing occur after an anesthetic, or an abdominal operation. The relation between the anesthetic and the operation and the obesity is quite another matter.

The relation of the basal metabolic rate, to thyroid obesity or thyroid function is a very interesting thing. There seems to be a general recognition that the measurement of the basal metabolic rate is a measurement of thyroid function, and I am in no position and have no intention of disputing that fact. It is true that a good many times you will find a patient having the clinical signs of hypothyroidism, thyroid deficiency, that further will be able to tolerate considerable doses of desiccated thyroid of a supposedly active composition where the basal metabolic rate at the beginning will be within normal limits. It has been suggested that this is due to a combination of thyroid and posterior pituitary deficiency. Whether that explanation is correct or not, I do not know, but it is true that most folks can usually be given considerable doses of thyroid, lose considerable weight and feel better. Eventually they cease to lose weight through this thyroid except to be pushed to the point that it causes tachycardia, which would be inadvisable to say the least. It is also true that a good many times a patient will show no subnormal metabolic rate and yet be able to tolerate a considerable dose of thyroid with a consequent loss of weight.

Regarding gonadal obesity, I would like to differ with Dr. Kern if I may. I doubt if it always begins at puberty. It seems to me it begins later in life, perhaps at the age of thirty-five, probably at the beginning of what Morley Young calls the critical age. He believes the menopause extends over a period of about ten years. I am inclined to agree with him. The so-called gonadal obesity is more apt to occur, in my experience, about the age of thirty or thirty-five than it is earlier in life.

So far as physical therapy is concerned the use of ultra violet and other physical agents, I am unfamiliar with this branch of treatment. I think it is generally recognized that the ultra violet has something to do with the normal level. We know from experience that a lowered blood calcium is one of the commonest things we meet with so far as the disturbance of blood chemistry is concerned. Whether it has any relation to obesity or not is quite another matter.

Dr. Maximilian Kern: I am very glad indeed Dr. Hutton agreed with me on the exogenous and endogenous obesity.

I would like to suggest to Dr. Hutton that thyroid tolerance with low basal metabolism may be due to two things. Standardization of thyroid today is in a very deplorable state and it is not uncommon for a person to take pills which are supposed to contain thyroid, which would amount to no more than one-tenth the dose of some other product of this sort. Then again it may be due to a retarded oxidation. The patient with a lowered basal metabolism has a retarded power of oxidation, and it takes a great deal of stimulation of the thyroid before he can start to metabolize it, and when that point is reached he develops tachycardia and some of the symptoms of hyperthyroidism.

With regard to the gonadal condition at puberty, I didn't say that it begins at puberty, but I did say that you never look for it before puberty. I mentioned the fact that it is more a female condition and that it usually begins at menopause. In obesity we attribute it to two things, either the pituitary or thyroid, or mixed. If the thyroid is involved we have a subnormal basal metabolism, a general adiposity. In the pituitary type we have the well-known Frohlich's syndrome. The picture of Frohlich's syndrome is classical and anybody seeing one or two patients can always recognize it.

SOME MEDICAL ASPECTS OF GALL BLADDER DISORDERS*

ANTHONY BASSLER, M. D.
NEW YORK CITY

In all, up to within a few years ago, the records of our hospitals show very few gall bladder cases, and those they had were always instances of gall stones with colic, impaction or suppuration. With the advent of the Meltzer-Lyon method of diagnosis a marked stimulation of interest took place which was added to by the x ray in the work of Ariel George of this city, L. G. Cole of New York and the late Russell Carman of the Mayo Clinic. A further burst of interest took place when Graham devised his dye test and Stewart of New York made popular the oral method of using the dye. Then I came along with the pancreas test and the hospitals, clinics and private practices are now full of gall bladder cases, to which development of course, the surgeons added their quota of energetic interest and activity to help popularize the whole affair. Like in all new movements and interests in medicine, however, the diagnosis, conductions of medical treatment and operations are far more numerous than the subject justifiably allows, and slowly a worth while conservatism is creeping in all around which we hope will continue to develop in this subject.

No one who is not a student of abdominal conditions of chronic types can properly aspect the pros and cons of any subject in important and clinical ways. A new idea comes along and the major part of the profession promptly over emphasizes its importance and begin to make the diagnosis fit the patient sometimes irrespective of what is really wrong. The men who do the pioneer work in the discovery or devising of methods are commonly responsible for this in their over zealous efforts to put their work out and interests across. The little fellow listens to what he says or reads what he writes and catches on to the tail of the cart. The ebb tide of interest then runs riot until by failures the subject gets thrashed out, the wheat separated from the chaff, and then things are much better in understanding all around.

*Read before the New England Electrotherapeutic Association, Boston, October 18, 1927.

There were certainly more gall bladder pathologies existent years ago than were diagnosed and handled properly, which today is not the situation, because now these cases are being actively treated and in them there would surely be some that are properly gall bladder cases, and thus, these are now being handled wisely. In my opinion, the diagnosis of a gall bladder disorder, other than when stones with colic are present, is one of the most difficult in the abdomen to make correctly. To depend upon any one method of examination is poor service, and commonly all of the known methods, unless properly correlated with most careful analytical history taking and exhaustive examinations, with time and study are essential to do justice to the patient, the subject and the art of medicine. It is my belief that the Meltzer-Lyon method of diagnosis on cases proven at operation is at least half the time wrong positively or negatively, the direct x ray method can only show stones in about one-third of all those bearing gall stones, the indirect x ray method is about half the time wrong, the visualization of the gall bladder for the diagnosis of chronic cholecystitis at least half the time wrong by the best of technic and most capable of examiners, the dye method, intravenous or by mouth, is wrong in at least twenty per cent of the instances, and the same is more true with my own pancreas method. Thus it is that throughout the whole profession where tests are depended upon solely the positive diagnosis is more time made than that significant gall bladder condition exists. Therefore, it is evident that the history side maintains its pristine position of importance, and upon which I will speak for a few moments.

Jaundice is always an important symptom, especially in involvement of the ducts or impaction, or stenosis. This may be slight or transitory with or without a slow pulse rate. When suppuration in the ducts is present the symptoms are severe with jaundice always present and the picture of sepsis definite, with swollen and tender liver and gall bladder and leukocytosis which

are always suggestive features. The severe paroxysmal pain in the right side of the abdomen in the region of the liver is quite characteristic of acute infective cholecystitis, and this when accompanied with fever, nausea and vomiting, prostration with distension of the abdomen and rigidity, is a classic picture, and when once seen is never forgotten. In chronic cholecystitis, however, there are many changes of symptoms, most of which are the same as when gall stones are present, not so severe in colic ways and more especially intense gastric ways,—or those of indigestion, such as gas, belching, indefinite distress, slight chills, periods of vague ill health, etc. Of course, pain with tenderness in the region of the gall bladder is the predominant symptom and this must be more or less steadily present in chronic ways. Stenosis and obstruction of the bile ducts present rather definite symptoms in the presence of jaundice, and when the obstruction is chronic a hepatic intermittent fever is most helpful to diagnosis.

Gall stones offer a most interesting chapter in the subject. The symptoms here are classifiable. One has the few instances of the septic types which due to migration of stones or of obstruction carrying infection cause different types of septic conditions to arise. Then comes the classic picture of biliary colic which you are all familiar with, and then those due to obstruction of the ducts causing dilitation of the gall bladder, those due to acute cholecystitis, suppurative cholecystitis, the calcification of the gall bladder, the atrophy of the organ, and finally those due to incomplete obstruction of the common ducts with infective or suppurative conditions in the tubes. Finally added to these are the more remote affects of gall stones in fistulas to the skin, gastro-intestinal tract, bronchus, urinary passages, peritoneum, the blood vessels and lastly obstruction of the bowel by gall stones.

The diagnosis of any disease and its intelligent interpretation depends much upon the recognition of pathology as evidenced by symptoms. In gall bladder diseases this largely conditions whether a case is medical or surgical. The early symptoms here, and sometimes the late ones, may be insidious as well as frank and self evident. In addition to testing the efficiency of the pancreas to unravel a case, sometimes the laboratory tests, such as the chemical examination of the urine for bile in latent jaundice for bilirubin and urobilin, and the icteric index of the blood serum comes prominently forward. The individual's carbohydrate tolerance and status of kidney function are important for selection of diets, whether operation is justifiable and if so, the anesthetic to select. Omitting further clinical consideration, the x ray, duodenal tube and other methods of help in diagnosis, I want now to present a few facts which clinical experience has proven to be valuable in treatment. Once the diagnosis is made, the treatment should be energetic. Every focus of infection about the nose, throat and teeth should be done away with. The reason for this is because swallowed bacteria can infect the ducts and sac by an ascending infection and we still believe by the more indirect blood stream route. Diets for hyperglycemia are necessary in indicated people, the fat fast and feast day diets for the average case. All kinds of diets should keep in mind the stimulation of the gall bladder to empty by giving supplemental meals to the main ones. The stout patient can often be helped by a simple type of reduction diet. When the pancreas is a deficient one a diet which closely corresponds to the kinds employed in diabetes mellitus often works magically. Dieting for gall bladder pathologies is an essential part of treatment, but one should type this in kind according to the object to be accomplished. To be careless about it and to employ the same type of diet for all cases no where near meets the service that dieting can bring about.

Other than in the frank surgical cases, the next important item of treatment is physical exercise in the open. The automobile is making gall bladder cases most rapidly. Not a few physician patients of mine have given up their automobiles, remained on their feet between their calls much to their relief of symptoms. The post-parturient woman in the first year or two after the birth of her child should be made to walk more, and when nursing or not, her bowels must be made to move well each day.

When pain or tenderness is present the diathermic current regularly used is of great value. Other physical treatment such as invective light,

the sinusoidal current, or the static also are helpful. Alternate mustard plasters and ice bags for short periods are also of assistance, especially is this valuable when nausea or vomiting is present. Heat for an hour after meals is useful when gastric hyperaesthesia is present. For an acute attack of biliary colic there is nothing superior to a hypodermic of morphin with atropin. Pantopon is an excellent substitute if more than one dose is required. For running indigestion one of the bromid salts, preferably the strontium with a velerian preparation may be grateful. Any of the animal oils before meals or on an empty stomach would relieve gastric hyperacidity and spasm. The oils also stimulate bile flow in that way overcoming biliary stasis. Carlsbad sprudel salts in hot water before breakfast is not only a laxative but controls the gastro-duodenal catarrh that most of these patients have. Old people are often kept free from attacks with sodium succinate in ten grain doses before retiring. A pill of some value when taken steadily is the following:

Rx—Acid sodium oleate
Sodium salicylicum aa 4.0
Phenolphthalein 1.0
Mentholis 0.4
Fiat Pill No. 50.
Sig.—Take two before breakfast and on retiring, followed by a glass of warm water.

There are many types of medication of secret and mysterious formulae in pills, capsules, etc., advertised as good to employ. My experience with practically all of them has not been satisfactory. If you will adhere to the medical plan I have outlined you will accomplish about all that is possible, and thas means all that is necessary in the average case. Biliary aspirations, first continuous until at least a quart of fluid has been abstracted, and then intermittently after that for several weeks may be necessary to turn the case favorable for medical handling. Surgery is necessary, preferably a cholecystectomy, if the case is frankly acute with alarming symptoms, stones are troublesome, impaction in the common duct exists, sepsis or marked circulatory troubles can be suspected as being present. One must watch too for the production of organic disease of the pancreas, which when due to gall bladder pathology does not repair without the removal of the gall bladder.

There are many other points of interest in this subject which time does not permit me to go into. I leave it, reiterating the advice that when the diagnosis is logically that of gall bladder disorder, energetic treatment is called for in the medical or surgical handling. Nothing short of this does justice to the art of medicine today in these disorders as we understand them. All avenues of medical approach should be engaged in because at best our treatment here is only indirect. Time and patience are essential. From a frank surgical attitude on treatment a few years ago, I am today far more conservative in the conscientious individual. As time goes on and experience multiplies with this policy, I am happier because of satisfactions to a greater number of people than I was able to give years ago.

21 West 74 Street.

THE EMPLOYMENT OF PHYSICAL AGENTS IN UROLOGY*

JOHN H. CUNNINGHAM, M.D.
BOSTON

What I have to say is in connection with certain physical agents employed as therapeutic measures. Our experience with such physical agents has been limited largely to the use of radium and electricity in the form of a destructive agent in connection with benign and malignant growths, particularly of the urinary bladder and cervix. We have also used diathermy, with good results, in chronic infection of the cervix. We have used both of these agents (radium and diathermy) independently and together in the destruction of growths of the bladder and cervix. We have also used both of them independently and together as an adjunct to surgery. I am convinced that both have established themselves as valuable aids as therapeutic measures and I hold the feeling at the present time that much more will be accomplished, particularly with electricity, in the future.

Our experience has largely been in connection with benign and malignant tumors of the bladder. The unfortunate feature in connection with these maladies is the fact that when patients present themselves, the growth is usually extensive. The medical profession is gradually becoming educated to the fact that the presence of blood in the urine, even in microscopical amounts, denotes the possibility of a serious condition somewhere within the urinary tract and that a painless hematuria is almost pathognomonic of tumor of the bladder.

By cystoscopic examination, the source of the bleeding, whether in the bladder or from the kidney, can be determined, and much may be learned from the visual appearance of any growth in the bladder as to whether or not it is benign or malignant.

Bier in 1910 demonstrated the fact that benign tumors of the bladder could be destroyed with a high frequency current by means of an electrode introduced through the cystoscope. Further experience has shown that some malignant tumors of the bladder, which cannot be eradicated by fulguration, as suggested by Bier, are readily influenced by this current, if subjected to the influence of radium.

Just what radium does to make possible the destruction of some tumors of the bladder by subsequent fulguration is not known. Certain it is that the employment of this form of treatment in benign tumors is far better than any attempt to destroy such growths by surgery, as the growths are often multiple and recurrence is not uncommon. Fulguration has made possible the destruction of such growths by the simple procedure of cystoscopy, without confinement to the hospital, and if recurrences take place, they are far better dealt with by this procedure than could possibly be done by repeatedly opening the bladder.

It has, therefore, become quite settled in the minds of urologists that benign tumors of the bladder and certain malignant tumors of the bladder are best subjected to fulguration, with or without the aid of radiation by radium element or seeds through the cystoscope rather than by opening the bladder.

When malignant tumors of the bladder are observed they are usually so advanced that a very radical surgical procedure is necessary to give any chance of a cure, and in the majority of such instances, the tumor cannot be entirely resected with a fair margin of normal tissue about it to insure an entire elimination of the disease. When the malignant tumor of the bladder is located on the base, resection has to be most extensive, and can rarely be carried out, even with severing of the ureters and transplanting them into the reconstructed bladder or into the bowel.

It is in this group, which may be termed the nonoperative group, that diathermy and the employment of radium has been of great service. It has been demonstrated that heat in the proper form, generated by electricity, is an agent which produces destruction of tissue cells. The employment of such a current has been, until lately,

*Read at the second annual meeting of the New England Association of Physical Therapeutics, Boston, Oct. 19, 1927.

without any definite guage of accuracy, so that when such a current is employed in the destruction of a tumor, the amount of the doses has been largely a matter of personal judgment. In many instances, too little destruction is produced and in others, too much.

Having appreciated clearly the advantages of diathermy in connection with large malignant growths of the urinary bladder, which could not be resected, we solicited the interest of Dr. Bovie, professor of bio-physics at Harvard University, to develop an instrument by which we could guage the amount of heat developed in the tumor mass. We have been employing the instrument developed by Dr. Bovie during the past three years and by its employment, we feel that we are able to determine the exact degree of temperature at the periphery of the area which we desire to destroy. By this method of controlled diathermy we feel that we can destroy the diseased tissue without distruction of normal tissue.

The employment of surgical diathermy in connection with carcinoma of the cervix has the same principles of application as malignant growths of the bladder, and here, too, the feature of knowing how much is being accomplished by the current within the tissues is guaged by the instrument which Dr. Bovie has created.

46 Gloucester St., Boston, Mass.

DISCUSSION

Dr. George Austin Wyeth, (New York City): I just want to take the time to point out the importance of Dr. Cunningham's work. It is an exremely important thing to measure the degree of heat produced in an instrument. Differentiate that and get that plain. Dr. Cunningham is measuring the heat produced in the tissue. Heretofore it has always been possible to see how hot the instrument was, but Dr. Cunningham and Dr. Bovie have measured the heat in the tissue.

Another point I want to make is to correct myself. When I said in bladder carcinoma with the large sloughing area I think endothermy is the method to remove that growth, but I never rely on that alone. Remove by endothermy the large sloughing mass and then follow always with radium.

Dr. Arthur H. Crosbie (Boston, Mass.): I agree entirely with Dr. Wyeth that when it is possible to have the bladder open the growth should be removed. What I like to do is to take rather a large electrode and sear the growth over with the coagulation current. Then I take the needle, go around the growth and coagulate there. Then with the endothermy knife I cut it out. I rarely attempt to destroy a growth and leave it. I try to sear it over and cut it out with the endothermy.

Dr. William Benham Snow (New York City): I want to speak particularly on metastasis in these pelvic cases. I think the use of radium as a method of destruction locally may answer the purpose, but suppose these cases with extensive developments already show an extension of metastasis upward into the lymphatic supply in the pelvic region. There is no one thing that will handle that like the x ray and I regret very much the tendency to get away from x rays in the management of these cases, and it is all due to the fact that the x ray has not been properly employed. The use of massive doses is wrong. A cumulative agent used successfully with small doses will give effects you cannot get otherwise. Do not be afraid of an erythema produced by small doses. Holzknecht has come out himself and plainly showed that they are all wrong in the

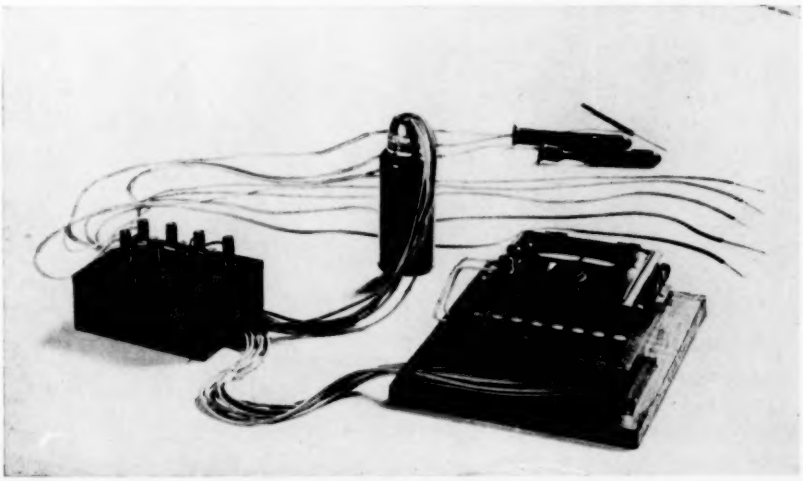


Fig. 1. Assembled apparatus for controlled diathermy.

unit doses, that small doses are what should be used. One reason was that at mitosis the cancer cell was vulnerable.

Clark of Philadelphia has instituted the use of x rays daily and he gets better results than he ever did by any other method.

I will just cite one case to illustrate what x rays will do. A man has been operated on by prostatectomy. Surgery did nothing and he had a tumor as large as your fist in the anterior wall of the bladder. The suprapubic opening was open and he had been given up. I had referred the case to the surgeon and I asked him why he had not sent the case back to me when he found he had malignancy. The case came back to me and within three weeks the suprapubic opening was closed and in six weeks the tumor had disappeared. The man went to business for one whole year as a night watchman and then finally he had a recurrence higher up. I had rayed low down, perhaps four inches below the pubis where the lesion was. Had I used the ray about the umbilicus as I do now he would probably have lasted longer.

Don't forget to rely on the x ray for helping with these metastatic conditions. Do not be afraid of a dermatitis. For twenty-five years I have never had an x ray dermatitis I could not control. Do not rely on radium. It is the greatest mistake in the world to give radium in such a large place. The x ray is far superior. I know from experience.

Dr. Louis Feldman (Boston, Mass.): I happened to be present at a meeting at the Huntington Hospital when Dr. Harvey Cushing was demonstrating some cases of supposedly inoperable types of tumor of the brain which he removed by means of the endotherm knife. He was apparently very well pleased with it and he made the statement that the electric surgeons of the future will look down at us as we do on silk ligatures.

Dr. John Cunningham (Closing): In all my cases of carcinoma of the bladder I always use deep x ray therapy following the operation. I leave the dose entirely to the radiologist. I rather think they are large doses.

The machine which Dr. Cushing uses is the machine which Professor Bovie developed.

Technical note: The thermo-electric pyrometer, or thermo-couple, consists of two thermo-junctions arranged in electrical circuit with an instrument which may measure either current or electromotive force. The instrument which we have used is a micro-galvanometer and measures current, but it has been provided with a scale calibrated so that it indicates temperatures.

Each thermo-junction is formed by the joining of two dissimilar metals. A number of metals might be used for this purpose. We have used copper and ideal-alloy wires. The two wires may be merely twisted together, soldered, or electrically welded. Electrical

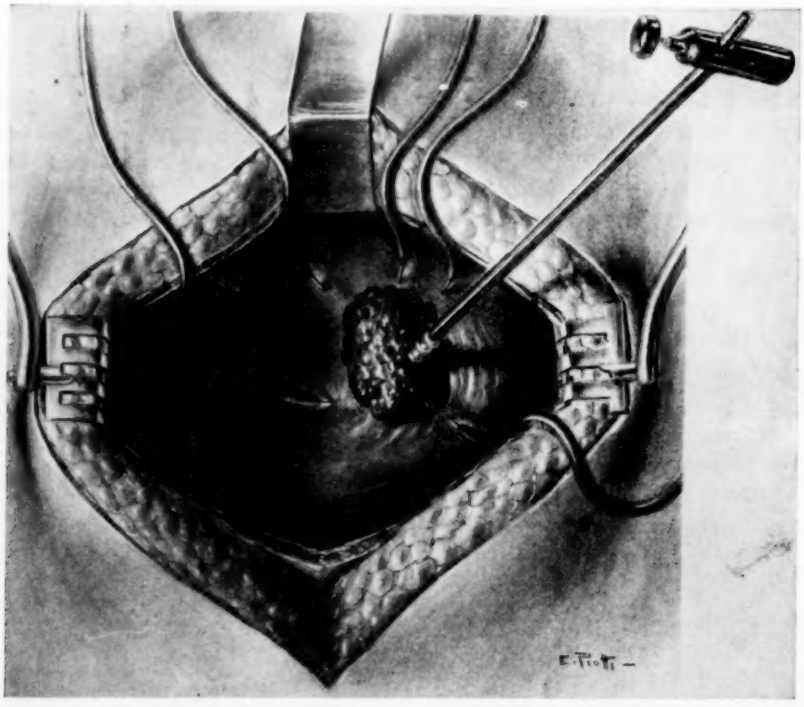


Fig. 2. Bladder tumor, with five thermal coup les implanted in the normal tissue around the periphery of the growth.

welding makes more permanent junctions. The junctions in this instrument are welded.

The thermo-couple consists of a pair of thermo-junctions joined into an electrical circuit.

When two dissimilar metals are joined, there is an electromotive force at the junction, the amount of which is a function of the temperature of the junction. When the metals are arranged in the circuit there are two junctions. Each of the junctions is the seat of an electromotive force, but it will be observed that as we pass around the circuit in any direction we pass from one metal to the other in reverse order, so that the two electromotive forces are in the opposite direction. If the junstions are at the same temperature these electromotive forces exactly balance each other and no current flows through the circuit.

If the junctions are not at the same temperature, then the two electromotive forces do not balance and an electric current flows in the circuit. By measuring this current, or by measuring the differences between the two electromotive forces, one can determine the difference in temperature of the junctions, and if the temperature of one junction is known, the temperature of the other may also be known.

The variable thermo-junction in this apparatus is formed of fine wires, copper and ideal, which are inserted in the tip of a hollow needle. The constant junctions are placed in a thermos bottle which also contains a mercury thermometer. If the variable junction, the one in the needle, is at the same temperature as the constant junction in the thermos bottle, no current will flow through the circuit and the pointer of the galvanometer will not be deflected. If the temperature of the variable junction is different from that of the constant junction, a current flows and the pointer on the galvanometer is deflected.

Since it is convenient for the surgeon to have several thermo-junctions embedded in the tissues at one time, a plug switch and a selector switch have been included in the circuit so that any pair of junctions can be instantly switched into circuit with the galvanometer. Since the galvanometer has a period of only two or three seconds the readings may be made very rapidly.

THE ROLE OF PHYSICAL THERAPY IN OSTEOMYELITIS*

PHILIP H. KREUSCHER, M. D., F. A. C. S.
CHICAGO

Osteomyelitis is a disease of the bone which has thus far resisted operative and non-operative treatment to such an extent that it is still one of the most obstinate of chronic infections. There is no one line of treatment which is successful in all cases. During the last ten years the influenza infections have brought with them many cases of osteomyelitis in all parts of the country. The great increase in industrial activity has supplied us with innumerable cases of this bone disease.

Etiologically and therapeutically we differentiate two very distinctive types. First, a traumatic and second, the metastatic or hematogenous.

In the first instance the infection is introduced from without usually in the case of a compound fracture or open wound extending down to the bone. Very often there may be merely a blister on the skin or a slight skin infection. This skin infection rapidly finds its way to the traumatized or punctured periosteum and infection of the deeper tissues results. The organisms multiply, setting up a subperiosteal infection and then by continuity or contiguity extend into the Haversian systems and medullary canal. I have often made the statement that there is no longer an excuse for any surgeon to permit a frank osteomyelitis following a compound fracture to develop in a case which he has had under his care from the beginning. In spite of one's efforts, however, such an infection occasionally does occur.

In the second or hematogenous type of osteomyelitis we have a far greater problem. Following a mild bruise or trauma and often without trauma there develops an abscess in the bone apparently from nowhere—the infection carried from some distal focus usually gets into the ends of the bone, into the Haversian canals or medulla. There the infection gains foothold and as you can readilly see very often does not remain localized but involves the entire circumference of the bone from the epiphyseal line as far as half way along the shaft depending

*Read at the sixth annual meeting of the American College of Physical Therapy, Chicago, Nov. 3, 1927.

upon the virulence and intensity of the infection. The treatment of these two types involves two entirely different principles. In the first instance one needs only to eradicate the introduced infection by a thorough cleansing and debridement. In this way any particles of foreign material containing bacteria is readily removed. There is very little place for physical therapy in this variety of osteomyelitis and particularly at this stage.

In the hematogenous type the treatment consists of very early drainage and subsequently a removal of the diseased bone. Most every imaginable method of procedure has been conceived and brought forth in chronic osteomyelitis. We have gone through the various stages including the use of the Morhoff plug, Beck's paste, Carroll-Dakin treatment, the implantation of muscle and fat and finally the implantation of skin into the scooped out bone. We have all had our successes and failures with these various methods.

A thorough knowledge of the pathologic processes involved in the various stages of osteomyelitis is absolutely necessary if one wishes to apply rational treatment. It is my firm belief that we have all been too conservative. We have made small drainage opening here and there, have scraped a little bone, possibly removed only a very small portion of the sequestrum and wondered why it did not heal. All cases of osteomyelitis are primarily surgical. If we hope to cure even a fair percentage of our chronic cases we must proceed with radical operative measures. A complete uncovering of all the diseased shaft is imperative. The periosteum must be incised and pushed away. With a motor saw or with chisels the entire coffin lid is removed from this hot bed of infection in the medulla. It is not sufficient to merely trench the bone, thus leaving overhanging ledges. It is important that the bone be saucerized, thus bringing the diseased bone to the surface. After all of the diseased bone is removed one would have reason to believe that prompt healing should take place were it not for the fact that the surrounding soft tissue is nearly always infected and infiltrated. This consolidation or condensed pus in the form of induration has been the greatest hindrance in the healing of osteomyelitis. It is not rational treatment to merely introduce a tube and nicely cover it over with infected soft tissue and skin. The bone must be kept entirely exposed so that such agents may be applied as will aid in the clearing up of the soft tissue infection. It is at this point that physical therapy should play its greatest role.

I think most surgeons have been at fault in not utilizing physical measures in performing this great task. We have gone about seeking various antiseptic solutions, antiseptic pastes, when nearest at hand were very simple physical measures. Unfortunately we live in a part of the country in which the sun's ray and its beneficial action cannot be employed consistently and regularly. We have often employed heat as an agent for the cure of infection, often forgetting that moderate moist heat favors the growth of bacteria. This disadvantage is not counteracted by the fact that heat brings more blood into the part to neutralize the infection. The application of oxygen gas to the infected surface might be a splendid measure were it not for the fact that it so readily diffuses and is lost in ordinary infected air of the hospital ward.

True, artificial sunlight has its very definite effect and should be used. Radiant light brings more blood to the part, relieves pain, but again this also has the disadvantage of warming up the tissues and favoring bacterial growth.

The actinic ray in the form of the ultra violet is our greatest hope in the eradication of these infections. The element of heat here is negligible and therefore, the ray may be carried directly into the deeper tissues.

Heat can be applied only to the extent of tissue tolerance. The ultra violet ray may be brought into contact with the diseasesd tissue for considerable length of time. The rays are absorbed very promptly by the capillaries, the leucocytic count is increased or stabilized and a general stimulating effect is evidenced in the tissue. The local application of the ultra violet ray either with or without the application of radiant light is not sufficient to bring about a favorable systemic reaction. It is necessary that

the various portions of the body should be exposed and if it is true that the rays are absorbed by the capillaries and larger blood vessels, then it would seem rational that chiefly those portions of the body be exposed where the vessels lie nerest the surface—the groins, the axillary spaces, the sides of the neck and the popliteal areas. In the local application of the ultra violet ray it would seem unreasonable to me to expect much result when we make an exposure of a cavity in which is contained half an inch or more of thick pus which in turn is covered with a layer of muscles, fat and skin often several inches thick. If we expect the greatest benefit we must keep the infected bone entirly exposed by some means or other, using Farr retractors if necessary. The muscles and skin must be held aside throughout the entire extent of the infected bone. I belive if th's technic were carried out as a routine the maximum amount of ray could be applied where it is most efficacious.

Osteomyelitis is such a chronic and such a serious bone condition that all rational measures must be utilized, no one is sufficient in itself. I wish to warn those of you who make the application of physical agents a specialty not to become over enthusiastic in your treatment of bone and joint infections. These infections are always deep seated, supplied by a sufficient amount of fuel to keep them alive and localized in noncollapsible tissue. Be not misguided by the relief of pain which sometimes follows the application of several doses of ultra violet ray or radiant light. This relief may come as a coincidence, following the liberation of pus under pressure from some other cause. The report of improvement of a chronic condition even though it may appear in beautiful print does not indicate a cure. Radical surgery first then the stimulation of ultra violet ray directly in contact with the disease.

I make a plea for a more rational study of osteomyelitis, its pathologic significance and more rational application of physical agents in its treatment. A knowledge of histo-pathology, a knowledge of physiology, a thorough knowledge of and experience in the handling of the various physical agents is always imperative. All of this knowledge cannot be obtained from the smooth talking salesman.

DISCUSSION

CHAIRMAN KOBAK: I think I am as interested in Dr. Kreuscher's paper as anyone in Chicago for I have the benefit of his vast experience on the staff of the Cook County Hospital. I welcome this expression of Dr. Kreuscher's interest in osteomyelitic conditions because I wish to remind him that in years previous I also made some studies in the same types of cases. We obtained some good results with diathermy, in association with all the orthodox and classical surgical procedures.

DR. FRANK H. WALKE (Shreveport, La.): My experience with osteomyelitis has been with the traumatic type. Our conditions are from the infection of bone, rather than so much of the endogenous type. I have in mind several cases, two that I have under treatment at present. These are children who were supposed to have had growing pains or rheumatism. One had it in the arm with a temperature of 106. Under gas anesthesia the arm was opened and drained of a couple of teacupsful of pus. The bone did not seem to be involved to a great extent on feeling it. As I drilled into the bone, however, I got pus. I chiseled away a slight amount of bone, and at a subsequent operation cleaned it up.

The other case was an individual who claimed if he had bumped his ankle he didn't know it. He had a slight tendency to a bunion; it was not extreme, and had never given him any trouble. An x ray showed a great deal of destruction of bone. We went in and chiseled it out.

In the treatment of the traumatic conditions, I have been using diathermy and ultra violet with very excellent results. Several years ago I introduced the method of using two machines at the same time on long bones, using a cuff above and one below for high frequency and a lateral at the same time by which I was able to elevate the temperature in the tissues two or three degrees higher. I tried to use one above and one below, then tried it laterally at the point, and it did not work as well as the two machines at the same time.

We must not overlook the general condition of the patient. Many times we find in those of calcium deficiencies that the hemoglobin is low, I try to improve their diet and balance it for vitamins.

DR. HENRY MEYERDING (Rochester, Minn.): If I discuss the subject of osteomyelitis briefly before an audience that is in the main interested in the subject of physical therapy, I want to apologize if I review briefly what the indications for treatment are in osteomyelitis. In the first place, the reaction of bone to infection varies, markedly. We see occasionally staphylococcus infections which have existed for ten to fifteen years with mild rheumatic pains, and the true character of the lesion is rarely suspected until an x ray is taken and a cyst-like cavity is found. Of course physical therapy would have a role here in relief of pain and possibly increasing blood supply, but we have another

type, almost a malignant type of osteomyelitis, ushered in by high temperature, high leukocytes, extreme pain, and the patient is in a very serious condition almost from the onset. Frequently no focus is found, no point of drainage to be established can be located for a time, but we have a symptom complex which we might suspect as pneumonia. When we have that condition and when localization is expected, no surgeon should be condemned who makes an exploratory incision and opens the periosteum and drills a hole in the hope of getting into his infected area early. If he is there in time he may get there before much pus is formed, and indeed that is the object of his surgery, to get there before marked destruction of bone occurs.

In my work I rarely see an acute osteomyelitis. The patient who usually comes to me is usually the patient who has been going hither and thither for years with a discharging sinus and the examination discloses scarring, firm infiltration about the sinus, stiffness, perhaps, in the neighboring joint. The x ray picture is that of a huge sclerosing osteitis, with or without areas of medullary bone infection obvious. That is, surgery on this group has been so poor in result that today I have extreme hesitation to do what formerly was known as the Bier or Beck operation which was referred to a few moments ago, namely, the uncovering and flattening out of huge sections of bone in the femur and tibia in order to eliminate most of the infected bone area.

If you have had a large experience you will know that the x ray does not always disclose these foci remaining in the bone, and you may begin chiseling and you will find the sharp edge of your chisel crumbling under this almost marble-like bone. If you are not careful in chiseling you will find that the bone is apt to crack in one direction or another and you may have a fracture. As you chisel through and inspect the bone you may find here and there a focus containing pus or granulation tissue the size of a bean or a pea. What is the method of treatment preferable in these chronic cases? What are we going to do with the sinuses that have been repeatedly curetted, with joint stiffness? If there is any place for physical therapy to do any good, it is in these chronic cases. Curettage alone seldom is of any permanent benefit, but I may add that great benefit is derived from prolonged treatment along physical therapy lines. If it is tuberculosis, which we are not discussing, by the way, I am a strong advocate of heliotherapy instead of surgery, because we have repeatedly seen sinuses operated and healed permanently under heliotherapy.

One word about the effect of these various electrotherapeutic methods. If we have impaired circulation, fibrosis of the soft periosteal tissues, and we have removed the sequestra and drained the abscesses, there is very little benefit to be derived unless we have cavities formed which are improperly drained. These cavities we have found are very well treated by a plain vaseline pack after operation and then giving these patients heliotherapy or infra red down in the cavity on removal of the pack.

Dr. S. C. Woldenberg (Chicago): I have heard the paper and the discussion and I want to take exception to a few points: First, that diathermy should be used from a physiotherapeutic standpoint in the application to osteomyelitis. I think that is absolutely wrong. We will agree that when osteomyelitis is in the acute or chronic state, sequestra should be removed and pus evacuated. The second point that you must keep in mind is if you are not going to drain first, but introduce physical therapy, you are going to spread the infection, with all the hazardous results incident to it.

We all talk about ultra violet or the actinic ray to be used in these conditions, but none of us (I may be included) think of it the way it should be applied. If you follow Rollier or any man who has been a pioneer in this work, you will find that they have a certain systematic treatment that is followed out. I have seen hundreds of cases during the war and in the Veterans' Bureau, in private practice and clinical work; the first thing the patient does is come to the physiotherapeutist.

I think this college should start out with a certain systematic way of teaching the application of the different physiotherapeutic applications in osteomyelities and many other diseases. We are enthusiastic over some things and we are not following the details of the treatment in order to get results. You cannot get results unless you are very accurate in this work.

We must remember that when we are taught the treatment of pneumonia we usually know the dosage of the medicine. After we have had a little experience we vary the doses as indicated. The same thing should apply in administering ultra violet light as a remedial agent.

Dr. Gustav Kolischer (Chicago): I don't think that anybody, and certainly not Dr. Kreuscher, recommended the indiscriminate administration of diathermy. It goes without saying that the thing must be done in the proper way.

I would like to call special attention to an important point that, probably being too modest, Dr. Kreuscher did not emphasize in his paper: That is the application of ultra violet rays generally.

The blood carries material through the cells of the reticular endothelial system. That is proven by the experiences of pediatrists. You know that excellent results in debilitated children are obtained, for instance, by applying general ultra violet treatment. I would like to claim for diathermy the same that Dr. Kreuscher does for ultra violet rays, which I think is the right way to do it, and that is a general application. You stimulate the defensive cells by ultra violet rays applied in the proper way. The same can be done by diathermy. I think the most progressive point in Dr. Kreuscher's paper is not only evacuation of pus and establishing the possibility of restitution of the

normal conditions at the point of infection, but general administration of ultra violet rays.

CHAIRMAN KOBAK: The Chair does not wish to take advantage of his position and enter into the discussions, but I should like to emphasize the various points that Dr. Kolischer and Dr. Walke have brought up, that ultra violet has a systemic effect as well as a local, and this applies also to diathermy. The heating effect is not the only thing in diathermy. The very fact that one of the outstanding laws in physiology is that when we raise the temperature (van Hoff's law) in the tissues one degree, this increases the oxidative powers ten degrees. Certainly this is suggestive that there is something more than the heating effect.

DR. PHILIP KREUSCHER (closing): When I came to you with this paper I admitted frankly that there are a great many of these cases that we don't seem to get well by surgical measures, and therefore we are coming to you as men who are specialists in the application of physical agents to help us out.

Until the last three or four months at the Cook County Hospital I did not realize how many cases of osteomyelitis there were in the wards that have been operated upon from 10 to 15 times, some of them 20 times. They have been scraped and drained, with no results. Occasionally by removing sequestra and uncovering the bone are we successful in some instances. I am not talking about that type of sclerosing osteomyelitis that Dr. Meyerding mentioned. I am glad he suggested the subject. I would like to send all of my cases of sclerosing osteomyelitis to him. That type is very, very difficult to manage, but the ordinary infectious type where there are sequestra (usually all of them lie in the medulla anyway) is the type we have to clean out and follow up with this treatment.

You physical therapists have a great field. A standardization of your methods I see is indicated, the same as standardization of various surgical methods. We have tried to standardize hospitals. We have tried to standardize methods of treatment of fractures. Now we are trying to standardize the treatment of osteomyelitis and we are trying to get together on the best thing to do. I believe your college has a great job also in getting together and having everyone apply the very best part of your methods. You have so many methods, some must be better than others; some must give results more quickly than others.

I hope that if nothing else comes of this little argument this afternoon, there will be at least a few unfortunates afflicted with this terrific, almost malignant disease of osteomyelitis, who will benefit from our little talk this afternoon.

THE NOBEL PRIZE

Has been awarded to these scientists for significant achievements in the realms of radiation phenomena.

N. R. Finsen	W. L. Bragg
W. K. Rontgen	Charles Barkla
H. A. Lorenz	M. Planck
P. Zeeman	Prof. J. Stark
H. A. Becquerel	Albert Einstein
P. Curie	Niels Bohr
Marie Curie	R. A. Millikan
Lord Rayleigh	Gus Hertz
P. Lenard	Arthur Compton
Sir J. J. Thompson	Charles T. R. Wilson
A. A. Michelson	Sir W. Ramsay
G. Marconi	Sir Ernest Rutherford
F. Braun	Frederick Soddy
W. Wien	F. W. Aston
W. H. Bragg	

COUNCIL ON PHYSICAL THERAPY OF AMERICAN MEDICAL ASSOCIATION*

H. J. HOLMQUEST, M.D. (M.E.)
Secretary, Council on Physical Therapy
CHICAGO

The Council on Physical Therapy as now organized comprises physicists, physiologists, pathologists and clinicians. The Secretary and General Manager of the Association and the Editor of *The Journal* are ex-officio members. H. J. Holmquist is the secretary. The methods and procedures which the Council on Pharmacy and Chemistry had evolved through twenty years of experience and which have been found to be effective are generally followed.

This Council, having to deal with many problems that are altogeher new, and working in a field that has as yet been inadequately explored from a scientific point of view, has proceeded slowly and with conservatism. Solutions to some of the problems confronting the Council are not yet apparent but these problems are receiving earnest consideration and as needed facts are developed and applied they will, it is hoped, be satisfactorily worked out. Without exception, the manufacturers of equipment for physical therapy have made known their desire to cooperate in placing physical therapy on a rational basis. Their cooperation will be of great assistance to the Council in solving the many problems with which it must deal.

For more than a year the Council has been developing the rules to be followed in action on devices submitted to it for inclusion in its list of accepted therapeutic apparatus. These rules are adopted primarily with a view of protecting the medical profession and the public against fraud, undesirable secrecy and objectionable advertising, in connection with the manufacture and sale of apparatus and methods for physical therapy. These rules will also be of the greatest service to manufacturers of such devices in standardizing their apparatus.

The Council has a number of committees: a committee on the present status of physical therapy; one on education; one on organization; one on nomenclature and definition, and one on standardization. Some of the committees have submitted reports that have been published in *The Journal* and have met with great approval by manufacturers, by the medical profession and by the public. The report of the committee on education was published as a preliminary report, to be followed by further reports on education in physical therapy and biophysics. This committee is now preparing more comprehensive reports on the status of education in physical therapy throughout the country.

The committee on nomenclature and definition is preparing a glossary of the terms used in physical therapy. The terms that will be defined are of two classes: (1) scientific terms and units which have been accurately defined by international scientific congress, and (2) terms peculiar to physical therapy, the committee will be guided largely by accepted usage whenever possible.

The committee on standardization is considering the standardization of apparatus with a view to assuring the profession that a device will deliver the particular physical energies which it is advertised to deliver and also with a view to minimizing fire and accident hazards of such apparatus.

The Council decided to publish a series of articles on the various branches of physical therapy, in which all that is definitely known concerning the value and the limitations of these modes of treatment will be recorded. Members of the Council were appointed as editors of these articles. The editors will ask those deemed best informed in the country to write on the various phases of physical therapy. These articles will appear from time to time in *The Journal*.

*A. M. A. Bulletin, April, 1928.

The Council has not restricted itself to the consideration of therapeutic apparatus and methods but will undertake the investigation of such matters as have importance to the medical profession and to the general public. For example, experiments are now being conducted by the Council to determine the degree to which various materials advertised as pervious to ultra violet rays will transmit such radiations. The results of these experiments will be incorporated in a Council report, to be published in *The Journal*. This information will be of great value to school, hospital and sanatorium authorities and to the general public.

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

DISRAELI KOBAK, M. D., Editor
Suite 820—30 North Michigan Avenue,
Chicago, Illinois.

Original contributions, exchanges and books for review should be forwarded to the Editorial Office. All business matters including advertising should be handled through the office of the managing editor, 1216 Medical Arts Bldg., Omaha, Nebraska.

The statements made in the manuscript published in the Archives of Physical Therapy, X Ray, Radium, are made solely on the responsibility of the author. Neither the American College of Physical Therapy nor the publishers assume any responsibility for statements contained therein.

Manuscripts accepted for publication in Archives of Physical Therapy, X Ray, Radium, are for exclusive publication and may not be published elsewhere.

Subscriptions—In the United States, its possessions, and Mexico, $5.00 yearly; Canada. $5.50; elsewhere, $6.50 the year.

Advertising rates on application. All advertising must conform to American Medical Association Rules.

Payments for subscriptions and advertising must be made to Archives of Physical Therapy, X Ray, Radium, in New York or Chicago Exchange.

ALBERT F. TYLER, M. D., Managing Editor

Published monthly at Omaha, Nebraska, by the Magic City Printing Company.

Seventh Annual Meeting
October 8-13, 1928
Stevens Hotel,
Chicago

AMERICAN COLLEGE OF PHYSICAL THERAPY SCIENTIFIC SESSION JUNE 11th, 1928. MINNEAPOLIS, MINN.

Hotel Radisson

PROGRAM

The American College of Physical Therapy will hold a one day scientific session, June 11th, 1928, at the Hotel Radisson, Minneapolis, Minnesota. This is just prior to the active meeting of the American Medical Association. The purpose of the one day session is to stimulate greater interest in the education of physical therapy, and also to emphasize the significance and value of the application of physical agents in the various specialties.

9 O'CLOCK A. M.

SYMPOSIUM ON EDUCATION IN PHYSICAL THERAPY

Physical Therpy in the Undergraduate Medical School Curriculum: D. KOBAK, M.D., Chicago.

Post-Graduate Teaching of Physical Therapy: JOHN STANLEY COULTER, M.D., Chicago.

Training of Physical Therapy Technicians: JAMES C. ELSOM, M.D., Madison, Wis.

Discussion of the foregoing papers will be in the form of an informal conference, for the pur-

pose of establishing so far as possible, some definite standards in education in physical therapy.

Ultra Violet Radiation as a Factor in Metabolism and Nutrition: PROF. VICTOR E. LEVINE, Omaha, Nebr.

2 O'CLOCK P.M.

The Present Status of Physical Therapy in Dermatology. (Lantern Slide Demonstration.): JOSEPH JORDAN ELLER, M.D., New York City.

Indications and Limitations for Physical Therapeutic Methods in Otolaryngology: A. R. HOLLENDER, M.D., Chicago.

Medical and Surgical Diathermy in Urologic Diseases: GUSTAVE KOLISCHER, M.D., Chicago.

Value of Physical Therapy in Internal Medical Diseases: GAGE CLEMENT, M.D., Duluth, Minn.

Discussion of the foregoing papers by R. W. Fouts, M.D., Omaha, Nebr.; A. D. Willmoth, M.D., Louisville, Ky.; Frank H. Walke, M.D., Shreveport, La.; J. E. G. Waddington, M.D., Detroit, Mich. and A. F. Tyler, M.D., Omaha, Nebr.

Physicians desirous of acquainting themselves with some of the newer phases of physical therapeutic methods will find this one day meeting of great interest.

Fellows and visitors of the American Medical Association are cordially nvited. On the evening of June 11,th there will be a college dinner and prominent leaders in physical therapy will offer addresses of special interest to all those engaged in physical therapy work.

IS THE PRESENT CONCEPTION OF DIATHERMY SCIENTIFIC?

Diathermy occupies the peculiar position of the spectacular and mysterious in present-day medicine. It is mysterious because its physical principles are not entirely agreed upon by those in authority; it is spectacular because the results are brilliant yet frequently erratic. Differences of opinion as to the utility of diathermy as a medical adjuvant of consequence have been advanced during the past year by investigators whose sincerity is never in doubt. Negations and affirmations as to its value in medical practice have recently found publication in outstanding scientific journals.

Penetration, a characteristic property of diathermy, and long accepted as a classical corollary of this agency, has been questioned. Bettman and Crohn[1] have attempted to advance the proof that the penetration of a diathermy current was limited to no further extent than skin effect. In spite of assumed limitations, and consequent condemnation by these workers, the clinician has found satisfaction in the fact that the results obtained with diathermy were effective in indicated conditions.

The question raised by Bettman and Crohn in regard to penetration has been definitely refuted and answered by the experimentations of Binger and Christie[2] of the Rockefeller Institute. These investigators proved with live animal experiments that in diathermizing the lungs the current reaches the profoundest depths of these organs. The experiments were scientifically controlled by thermocouple fixations within the chest wall and the temperature of the lung tissue was seen to rise above its normal optimum. Although the deep heating qualities have been established, the physical mysteries of this energy needs still further corroboration. *Voltage* is still a mooted and an important problem which requires clarification as to its relation to diathermy. Opinions based on theory vary as to whether this is the important factor influencing penetration. Since there is no unanimity of opinion regarding this subject, it is important that the profession and the physicist come to a common agreement. It must be remembered that science is defined as knowledge that is unified.

The question of *frequency* has received spasmodic emphasis as to its importance or its relation to penetration. More extensive research is needed to establish its real position in high frequency therapy. A train of other questions suggests itself that is of equal importance to a scientific understanding of the physical properties of diathermy. What is the optimum voltage and frequency best suited for diathermy? What are the physical and physiological differences between an Oudin and a Tesla

current? Wha tis the exact role of "capacity" and wherein does the small instrument differ fro mthe lrger model? Is there any scientific basis for higher amperage meters frequently found installed in the smaller apparatus? The answers to the questions propounded must be clear and mathematically certain. In order to establish this agency on a scientific basis speculation must give way to certainty, and metaphysics to physics. The apparent chaos and confusion that still exists is gradually placing this agency in an unjustified and precarious position in medicine. The unified efforts of all those who are interested in its future progress as vitally needed.

The issue whether diathermy is scientific or not is presented for decision to the clinician and the physicist. Attention of the manufacturer is directed to the necessity of co-operation in the solution of these vital problems. The Archives welcomes, and will give publication to any scientific exposition on the physical principles of diathermy. The need for a better understanding is urgent. D. K.

1. Diathermy in the Production of Deep Penetration. *Journal of A. M. A.* 88:8, Feb. 19, 1927.

2. *Journal of Experimental Medicine*, 1927, Vol. 46, Pp. 571, 585, 595, 715.

THE DEVELOPING RELATIONS OF THE PHYSICAL SCIENCES TO DENTISTRY, MEDICINE AND PHARMACY*

This rather unique yet up-to-the-minute subject was the text of an address by one of our prominent surgeons to the graduating classes of one of the leading universities in the central west. It is timely that some of the statements may be repeated in order that a larger audience be reached, for no subject at the present time is more vital and carries more import than that of the developing relations of the physical to the medical sciences.

"During the past century the fields of physics and chemistry have been extending with phenomenally rapid strides, and this progress, together with the ever increasing specialization within the field of medicine, has caused workers within this field to realize that they must look increasingly to the sciences of chemistry and of physics for the interpretation of vital forces and for aid in the extension of therapeutic measures.

"The medical sciences, of which dentistry, pharmacy, and medicine are subdivisions, are today struggling out from the state of empiricism toward the status of exact sciences. In this progress two tendencies may be noted, one toward increasing specialization within the medical field itself, the other toward increasing interrelations with other sciences—with physics and chemistry, in particular."

These statements need no further comment. They speak for themselves. Coming as they do from a reliable and deep-thinking source, they help only to emphasize a state of affairs that exists but not sufficiently realized. The day is now at hand when even the surgeon, wielding his scapel as he has in days gone by, is willing to appreciate that there is a definite relationship betwen the physical and chemical and medical sciences, and that "we must look to physics and chemistry for the interpretation of vital forces and for aid in the extension of therapeutic measures."

"To the science of physics we owe the development and all the achievements of radiology —the discovery of radium and its effects upon different media, and the development of methods for its application to the organism and for the preparation of radium emanations. Physicists developed the x ray, first for diagnostic purposes only, and later as a highly potent therapeutic agent; and physicists are now studying the effects of the x ray on biological tissues, while methods for varying and modifying the type and intensity of the rays are being investigated in order that their therapeutic potentialities may be still further extended."

It is indeed gratifying that a surgeon of international reputation— G. W. Grile—for it was he who made these statements—selected this subject for discussion. It is interesting to note, furthermore, that its purpose was to impress upon new entrants into medicine, dentistry and pharmacy, that much can be gained in knowledge by stepping into some of the related sciences for information and for basic principles which ultimately bear clinical and everyday practical application. We need more of these enlightening and awakening discussions. Phy-

sical therapy, reborn today with modernistic ideas, with perfected apparatus, with more skilled and scientific workers, requires encouragement, for some still consider that it is in a promotional stage. Progress has been made thus far. More progress will be made in the future if the younger men and women who enter our professions are inspired and instructed with such reasoning and such basic views as Crile presented in his address, some of the text of which is here liberally quoted. —A.R.H.

INTERNATIONAL CONFERENCE ON LIGHT AND HEAT IN MEDICINE

A second international conference on light and heat in medicine, surgery and public health is being organized by the *British Journal of Actinotherapy*, to be held at the University of London, England, October 29-November 1. An invitation is extended to American physicians and scientists to attend the conference. There will be clinics and an exhibit of apparatus for ultra violet, radiant heat and kindred forms of therapy. A special section will be devoted to vitamins. The first conference last year was important, and a greater number of prominent men are expected to take part this year. Every assistance will be given those who request information or attend the conference; inquiries should be addressed to the *British Journal of Actinotherapy*, 17 Featherstone Buildings, High Holborn, London, W. C. 1.

OPPORTUNITIES IN THE UNITED STATES CIVIL SERVICE

OCCUPATIONAL THERAPY AND PHYSIOTHERAPY AIDES

Four hundred and fifty occupational therapy and physiotherapy aides are employed in the United States Civil Service. The greater number of these are also employed at St. Elizabeths Hospital.

Salaries and grades.—Therapy aide posi-

DOCTORS—CITIZENS

It is all to the good that the horizon of one's mind should be widened, and the man who has no hobby but his work cannot make the best even of that work: narrow channels are seldom deep. It is the glory of our training that it is so wide, that it fits a man to do most things in life; too often, however, the exacting claims of practice when he becomes qualified, mop up all his activities, and I would plead with my hearers to be on their guard betimes against this narrowing outlook. And so I advise you to keep alive an eager interest in the great issues of the day, and when possible take a share in moulding them. You will be all the better doctors for being widely cultivated persons, concerned with many things besides medicine. The school which produced Thomas Young, perhaps the most versatile genius that has ever adorned medicine, takes you to its bosom today; and if you follow and live up to its traditions, you cannot fail to become admirable doctors, and what is even more important, admirable citizens of the world.—From an Address by E. Graham Little, M.D., F.R.C.P., London.

tions in the department service at Washington, D. C., are ordinarily of three grades, namely, aide, $1,500–$1,860; assistant chief aide, $1,860–$2,400; and chief aide, $2,100–$2,700. Promotion may be made from grade to grade in accordance with demonstrated merit and as opportunity offers. Salaries in the field—that is, outside the departmental service at Washington, correspond more or less relatively to those in washington. For the actual salaries received by aides, see the following paragraphs. The entrance salary of aides in field branches is ordinarily $1,680 or higher.

Examination requirements.—Occupational therapy aides are not assembled for examination but are rated on their education, training, and experience and physical ability. Certain requisites in the way of education and experience are prescribed. Physiotherapy aides are ordinarily rated on their education, training, and experience and on their answers to practical questions. The examination in practical questions is held in the larger cities throughout the country. Certain specifications are made as to education and experience. Examination announcements should be consulted for current requirements.

Veteran's' Bureau aides.—Two hundred and sixty-seven occupational therapy aides and 163 physiotherapy aides are employed in the hospitals of the Veterans' Bureau. Of this group, 40 are in a $2,100–$2,700 annual salary range; 83 in an $1,860–$2,400 range; and 307 in a $1,680–$2,040 range. Chief aides in Veterans' Bureau hospitals assist with reconstruction work in connection with occupational therapy or physiotherapy treatment and perform other duties incident to the work. Staff aides (occupational therapy), under supervision, are responsible for placing projects, teaching, and supervising crafts. Staff aides (physiotherapy), under supervision, are responsible for treatments including hydrotherapy, thermotherapy, massage, exercise, electrotherapy, and heliotherapy.

Fourteen occupational therapy aides two of whom come within an $1,860–$2,400 annual salary range and 12 within a $1,500–$1,860 range, are employed by St. Elizabeths Hospital. Four physiotherapy aides in the hospital receive salaries within a $1,500–$1,860 range.

For further information regarding the working environment of aides in the Veterans' Bureau and St. Elizabeths Hospital, see the description of the activities of those branches under the sections devoted to medical officers and nurses.

THE STUDENT'S LIBRARY

BOOKS REVIEWED

ASTHMA, ITS DIAGNOSIS AND TREATMENT. *William S. Thomas, M. D.*, associate attending physician in immunology, St. Luke's Hospital, New York City. Twenty illustrations in black and white and six in color; 279 pages, illustrated. Paul B. Hoeber, Inc., New York City, publishers.

HIGH FREQUENCY PRACTICE (new fifth edition), by *Burton Baker Grover*, M. D., ex-president Western Association of Physical Therapy. Rewritten and enlarged; new illustrations; 600 pages. Price, $6.00, postpaid. The Electron Press, 115 East Thirty-first Street, Kansas City, Mo.

UROGRAPHY. *Braasch and Hager.* The second edition of Braasch's Urography, the first having been published in 1915, brings this subject up to date.

This work, as is evident, is a classic which all students of urology as well as others, can well study with profit. The author is the recognized authority on this subject both in this country and abroad, and has given both in the text and the numerous illustrations, a clear presentation of the normal and pathologic.

The largest portion of this book covers the subject of pyelography and ureterography. A chapter devoted to cystography covers this subject very well.

Some mention is made of urethrography. It is possible that more space could have been profitably given to this subject which promises to be of value.

The title of this book, "Urography," literally indicates radiography of the urinary tract. But urology in its literal meaning indicates the study of the urinary tract only, although the field covers the male genitalia as well. So it seems as though there is something lack-

ing in this book to make it complete. The radiography of the seminal duct, epididymis, vas deferens, seminal vesicles and ejaculatory duct is not entirely experimental and has considerable clinical value. Future editions can well incorporate it.

This work is an addition to our knowledge and should be in the hands of every urologist and all others interested in the subject.

DISEASES OF THE MOUTH. *Sterling V. Mead*, D. D. S., Prof. Oral Surgery and Dis. of Mouth, Georgetown Dental Sch.; Prof. Dis. of Mouth, Georgetown Med. Sch.; Oral Surg. to Georgetown Hosp., etc. Second edition. Cloth. Pp. 578 with 274 original illustrations in the text and 31 full page color plates. St. Louis: C. V. Mosby Co., 1928.

It is indeed true that diseases of the mouth are for the most part given only passing note. In our curricula operative mouth pathology has been given a stinted place, but the medical problems relative to the oral cavity are usually passed by after devoting a couple lectures in the medical course prior to the discussion on gastro-intestinal disorders. The clinical significance of oral conditions are usually summed up under the general heading of focal infections. No particular note is given, no fundamental principles are enumerated nor practical knowledge unwoven sufficient to assist the examiner to make a correct diagnosis of the abnormality within the mouth, nor treatment to be instituted.

In order to accomplish the correct diagnosis and attempt the logical treatment, the author has instituted a definite routine plan of procedure for the making of oral examinations, for the recording of data obtained, and for the future care of the patient.

Dr. Mead is to be commended upon his masterly portrayal of a neglected science, presented in such a manner as to be not only a suitable text for the medical and dental student, but a handy office reference for the practitioner.

PERITONITIS. By *J. Garland Sherrill*, M. D., F. A. C. S., Colonel M. O. R. C., U. S. Army, formerly Prof. of Surgery, Kentucky Univ. Med. Dept.; fromerly Prof. Surgery, Univ. of Louisville, Med. Dept. A surgical monograph under editorial direction of Drs. *Dean Lewis, Eugene H. Pool,* and *Arthur W. Elting*, New York: D. Appleton & Co., 1925. Cloth. Pp. 397, 65 illustrations.

The peritoneum has occupied the attention of anatomists, physiologists, surgeons and research workers as interestingly as any other part of the human body; and with almost as little conclusive satisfaction as any other mysterious field. The question of peritoneal absorption, as vitally important to the general surgeon as any problem with which he is confronted, has been far from satisfactorily answered. Even after the painstaking years of research the question still arises whether the drainage is through the lymphatic system or the blood stream. The role of the greater and lesser omentum has not been answered. The qualitative problem, the rate of absorption, the toxicity, the relationship between paralytic ileus and peritoneal drainage are all unanswered. Why opening a rat one-half hour following the intraperitoneal injection of a recognizable substance such as India ink, should we find the material principally in the greater omentum, lesser omentum, under surface of the diaphragh, substernal tracts leading to anterior mediastinal lymph glands—we don't know. How such massive bodies can be taken up apparently into the greater omentum, we don't know. How soon particles get into the blood stream and become systemic, we don't know. The problem of peritoneal absorption has been but scratched. Perhaps the best text on this subject is that by Hertzler, a two volume work published in 1919. A recent article by Cunningham in the *J. Physiol* gives a wonderful review of the subject.

In the presentation under consideration, more attention has been given the clinical phase of the subject, although the first portion of the monograph is devoted to establishing a foundation for clinical observation—considering the histology, embryology, greater omentum, physiology, pain, irritants, hemorrhage, autotransfusion and foreign bodies. The general scope of the work done on this great question is included in this discussion. Compared to the clinical presentation of peritonitis, Dr. Sherrill's anatomical and physiological presentation is weak. But were one to master the principles outlined in this compact work, he would not go far wrong in his clinical respect for peritonitis.

INTERNATIONAL CLINICS. Vol. 1, thirty-eighth series. Edited by *Henry W. Cattell*, A. M., M. D., with the collaboration of some of the leading members of the medical profession throughout the world. Cloth. Pp. 307, with 100 illustration. Philadelphia: J. B. Lippincott, 1928.

The quarterly has a greater variety of subjects this time than usual. After devoting a section to diagnosis and treatment, another subdivision is given to medicine. In the former diagnostic and treatment problems such as tularemia, the sedimentation tests, visceroptosis, etc., are considered, while in the latter, epidemic encephalitis, intestinal amoebiasis and bacterial heart disease are discussed. Another takes up the presentation of pediatrics teaching problems. Surgery has besides its clinics a discussion on uterine fibroids, and the classification and indication for surgical treatment of goitre. Separate space is given traumatic surgery. Here the treatment of hand fractures, fractures of long bones and the use of pedicle grafts is presented. Otolaryngology, ophthalmology and pathology are given individual attention. The 1927 Mutter lecture of the College of Physicians of Philadelphia by *E. Starr Judd*, on the pathogenesis of gastric and duodenal ulcers is included. Medical history of the renaissance by *J. R. Oliver* follows. Medcal questionnaires precede the collation presentation of the progress of medicine in 1927, by *Henry E. Cattell.*

HANDBOOK OF DISEASES OF THE NOSE, THROAT AND EAR. For Students and Practitioners. By *W. S. Syme*, M.D., F.R.C.P., & S.G., F.R.S.E. Lecturer on Diseases of the Throat and Nose, Glasgow University; Surgeon for Diseases of the Throat and Nose, Western Infirmary, Glasgow; Surgeon, Ear, Nose and Throat Hospital, Glasgow; Consulting Aurist and Laryngologist, Royal Hospital for Sick Children, Glasgow, etc. New York: William Wood & Company, 1927. Edinburgh: E. & S. Livingstone.

This is the second edition of this little book containing 400 pages, the text of which is based on the author's own practice and observations. There are several x ray photographs and colored plates, the latter illustrating the types of rhinoscopy and laryngoscopy. One typifies a normal and diseased tympanic membrane.

The subject of physical therapy is conspicuous by its omission. There is a brief discussion of surgical diathermy in malignancies of the mouth and throat. There has been much progress in the use of light and heat and galvanism as therapeutic agents in ear, nose and throat diseases. Much of the work in this field has been noteworthy among English specialists. It seems rather strange, that in view of this situation, so little should be said in a modern text on a subject like physical therapy. Certainly, such therapy now beyond the experimental stage, deserves mention.

Only a brief discussion is found on deafness. This affection is much too important to be passed by so lightly. It has attracted attention from various sources and because of its economic aspect it merits more elaboration than is given to it even in such a small volume. Furthermore, inasmuch as this book is intended for students, subjects of general interest should be stressed and enlarged upon commensurate with their importance. Unfortunately this has not been in numerous instances.

Regardless of these shortcomings the book has merit and the assertions appear sound and in keeping with the best experiences in the ear, nose and throat specialty.

INTERNATIONAL ABSTRACTS

Heliotherapy and Renal Tuberculosis, Dr. A. Rollier, The Brit. J. of Tuberculosis, January, 1928.

The role of heliotherapy is outlined in this paper. Unilateral renal tuberculosis is discussed and Rollier's treatment given. Heliotherapy is advised as a particularly desirable post-operative treatment of unilateral renal tuberculosis. In bilateral renal tuberculosis heliotherapy is, in Rollier's opinion, the treatment of choice. But if this treatment is to be efficacious, it must be conducted according to the strictest posological rules and with a rigorously applied technic. These rules are of capital importance, for there is no therapeutic method which demands more fact in its administration or a stricter individualization than does the sun cure.

When the genito-urinary complications confer on the disease a character of gravity which affects the patient's morale, heliotherapy, by assuaging the pain and increasing the sensation of well-being, often restores courage and affords a new interest in life, with increasing confidence in the efficacy of his treatment, and this is already a step towards cure.

X Ray Dosage in the Practice of Dermatology. Thedering. Munchener Medizinische Wochenschrift, No. 74, 24, June 17, 1927.

The author arrives at some practical conclusions regarding x ray dosage in dermatological practice. There are individual variations of sensibility which are exceptions to the rule. Sometimes the correct dose applied at one session does not give the expected results. Complications, such as the insidious development of cutaneous atrophy, often occur particularly when treatment is renewed at the occurrence of a relapse. For safety, the author advises the use of weaker doses—a tenth or hundredth of the erythema dose, administered daily. The efficaciousness of these weak doses is equal to that of large doses. The total dose in chronic eczema should not exceed three to four X per field. The thickness of the aluminum through which the rays are filtered is directly proportional to the chronicity of the affection and the thickness of the skin. These homeopathic doses give excellent results in the cure of external tuberculoses. It is efficacious without causing depilation in the treatment of tricophytis and sycosis.

Gonorrhea in Women: Its Treatment by Diathermy, Winfield Scott Pugh, B. S., M. D., Physical Therapeutics, January, 1928.

This is a most comprehensive report on this frequently discussed subject. Several important phases of the problem are treated in such detail as they merit. The author states that the treatment of gonorrhea in the female has passed through various stages, (1) chemical, (2) surgical, (3) cautery, (4) diathermy. Each of these is reviewed. The diathermy technic is described. Glandular complications, urethral caruncle, endocervicitis are considered from several aspects. Acknowledgement is made of the pioneer work of Corbus and O'Connor. The author has notes on 500 cases. In

his own service and that of his clinical associates there are about 200 cases which have been observed directly. In this group the apparent bacteriologic and clinical cures are about seventy per cent. The vast majority of these infections were acute. The chief difficulty encountered has been with the urethral cases. Ten per cent could not continue urethral diathermy.

Clinical Experience with the Therapeutic Application of Cathode Rays. W. Baensch and R. Finsterbusch. Munch. Med. Wchsch., No. 51, Dec. 23, 1927. .

The cathode rays represent the current of negatively charged electrons which are emitted from the cathode of a Roentgen tube. They move in a straight line with a speed which depends on the voltage of the current. This electric current gets out from the tube into free space through an aluminum window at the end of the anode. Whereas ordinary radiation therapy is a physical agent with wave like movements, cathode irradiations consist of a direct discharge of electrons, which are moving at an enormous speed. The utilization of energy is therefore much greater than in Roentgen rays, in which only a fraction of all the cathode rays is effectual. The Cathode rays available at the present time have a very slight penetrating power, so that this method of treatment is applicable only for superficial therapy.

Cases of lupus exulcerans and tuberculosis verrucosa cutic, which were treated a long time, without success by other methods, were remarkably improved and almost completely cured by cathode irradiation. The technic was as follows: Two to three doses of fifteen to sixty seconds, 95 Kv. 3 M.A., 5 cm. distance.

A cure can be obtained in severe cases of psoriasis. Thick crusts are to be removed before irradiation, otherwise too many cathode rays are absorbed. Diffuse psoriasis cannot be treated by this method because the irradiation field cannot be too large. Convincing results were not brought about in chronic eczema. There were some good results, but there were also numerous complete failures.

An infected wound was quickly covered with skin, and the inflammation subsided by the application of cathode rays. The initial dose was two minutes and then fifteen seconds.

Very good results, not obtained with other methods of treatment were brought about in cancer by cathode irradiation (two minutes, 98 Kv. 3 M.A., 5 cm., four weeks later, one-half minute). Only those cases were treated which were refractory to Roentgen rays, or showed recurrences after operation. A definite improvement was shown both in those cases where tumor formation was in the ascendency as well as in those cases where ulceration exceeded tumor formation. In the beginning the ulcerated tumor surface secreted more than before (sign of slight burning). Soon, however, the wound dried and atrophy and connective scar contraction occurred. The question of the permanence of the cure can as yet not be decided.

Treatment with cathode rays requires patience, because the irradiation reaction must first disappear before the next dose can be administered, all of which takes considerable time.

The available masses of energy should be very carefully dosaged. Great amounts of Roentgen rays arise secondarily from the cathode rays. The greatest care should therefore be taken during the irradiation.

Radium Treatment of a Case of Lung and Pleural Metastases from Carcinoma of the Breast. K. Bross and R. Weekonski. Medycyna Praktyczna, No. 7-9, 1927. Abstract, Fortsch. der Med., No. 6, Feb. 10, 1928.

The patient is 43 years old. Her mother died of breast carcinoma. The patient noticed in 1917, at the age of 34, a tumor of the size of a strawberry, in the right breast. On biopsy the tumor was found to be cancer. As a result the breast was amputated. The patient had no symptoms until 1924. At the end of that year she began to cough, had difficulty in breathing, and had a pain in the region of the right scapula. These symptoms became so severe towards the end of the year that she had to seek medical help. At the examination in the hospital a right sided pleural exudae was found and one and one-half liters of fluid removed. The x ray picture made at that time showed dense shadows in the region of the right scapula and the hilus which were taken to represent tumors, most probably metastases from the breast cancer. Thirteen days later the dyspnea of the patient becoming very severe, 2150 ccm. of fluid were again drained. Since Roentgen irradiation of the affected side was found to be futile, radium irradiation was tried (143 mg. Ra Br2 with filter of 2 mm. silver, 1 of lead on seven fields). After the very first application an improvement in the condition of the patient was noticed. Whereas the patient was dyspneic before, breathing was now easier, and two months later 250 ccm. of fluid were again taken out of the pleural cavity. The previously dense parts on the x ray picture were now very light. The patient received a second series of irradiations of the same intensity as the first. There was no more any accumulation of fluid in the pleural cavity. Since then the patient was not drained, had no dyspnea, felt well and continued her work. Despite this improvement the cachexia seemed to progress (further loss in weight).

The authors are of the opinion that the amelioration in symptoms is to be ascribed to the radium treatment.

Mechanism of Biologic Action of Light. R. Wurmser. Revue d'Actinologie, April-June, 1927.

The photo-chemical hypothesis seems to the author to be the most reasonable. He reviews the principal facts which demonstrate it, and tries to show that the numerous reactions where the photo-chemical action is not very apparent, present the two characteristics of photo-chemical reactions: The proportionality of the speed to the energy received and its independence of the

temperature. But in reality the facts which are very convincing are concerned with very simple things or isolated functions. The facts are somewhat more difficult to explain when the action is on more complex things, such as the human organism. The human body becomes the siege of an infinite number of divers rays, each reacting on the other, the resultant of which is found in the infra red field (9.4 in the healthy individual). In the presence of pathological reactions the resultant is found towards the shorter or longer waved rays. The action of the various physical agents can have as a result the bringing of the living cell towards the normal, for these agents have wave lengths of all extremes: (human infra red range, 300 trillion per second, diathermy, 1 to 2 million per second, ultra violet, 1000 million per second). Such extremes are shown that it seems that they can act upon each other only by their resonance.

On the Effect of Dust and Dirt on the Transmissibility of Window Glass for Ultra Violet Rays. W. Hausmann and O. Krumpel. Strahlenther. 27, 2, 1927.

Large amounts of dust and urt had only a very slight influence on the transmissibility of window glass for ultra violet rays. Only a very enormous amount of dirt caused an appreciable decrease in the transmissibility. The presence of dirt results in a diffusion similar to the diffusion whch results when the ultra volet rays pass through the atmosphere.

The results of these experiments indicate once more the great value of glass which is transmissible for the ultra violet rays, when used in the windows in dwellings.

Physical Therapy of Hypophyseal Diseases, P. Liebesny, Zschr. f. Die Ges. Physikal. Ther, No. 34, 3, 1927.

The various indications are as follows: Roentgentherapy is the method of choice in benign acromegaly, but in the disturbances of vision it should only be considered in the beginning or in slowly progressing cases. The roentgen rays will affect the disturbance of sight only in dystrophia adiopeso genitalis. In one case the author obtained a reduction in body weight by diathermic treatment of the hypophyseal region. The treatment consisted of 16 sessions of twenty to thirty minutes each in a period of fourteen days. Hypophyseal diathermy is also capable of reactivating an absence of ovarian function. Successful results were also obtained in masculine impotency caused by endocrine disturbance. Diathermy of the hypophysis has a specific dynamic action with an increase in the metabolic rate.

Clinical End Results Following Diathermy in Gynecologic Conditions. Mortimer N. Hyams, M. D. Am. Jour. Ob. & Gyn., Vol. 15, Feb. 1928, p. 224.

By using a hypodermic electrode condylomata lata and Skene gland infections are satisfactorily destroyed after a preliminary local anaesthesia. Hyams believes that diathermy is superior to surgical excision in uretheral caruncles. Using diathermy in acute gonorrheal urthetritis 27 cases showed a negative smear after one, two or three treatments. In Bartholin infecions he prefers surgical excision, and G. C. endocervicitis has failed to satisfactorily clear up with medical diathermy, probably due to the harboring of the organisms in glands inaccessible to diathermic applications. In dysmenorrhea 50 per cent of 38 cases were relieved. Parametritis promptly responded to diathermy. Twenty-two cases having definite adnexal disease were treated by diathermy combined with injections of non-specific protein. Anterior posterior or abdominal electrodes were used. Three only of 22 cases came to operation. In two cases the tumor persisted, although diminished in size, and the remaining patients refused operation because their symptoms were definitely relieved.

Several Problems of Roentgen Biology in Experimental Tuberculosis. A. Epstein. Arch. Internat. de Med. Exp., No. 3, March, 1927, p. 469.

The author gives a comprehensive review of the effects of Roentgen rays on leucocytes, and the reaction of leucocytes towards tuberculous intections. He also reports his own experiments on guinea pigs with absolutely negative intracutaneous tuberculous reactions. Medium and strong Roentgen dosages cause a leucopenia and lymphopenia whose intensity and duration is proportional to the dose. Following the lymphopenia there is a lymphocytosis, which is intensive after 600 R., very great after 800 R., but there is no hypercompensation at all after 1000 R. The polynucleopenia arises a little later. The increase of leucocytes and lymphocytes after small Roentgen doses is explained by the author as phenomean of secondary hypercompensation after primary destruction. There is no fact supporting the hypothesis of a primary irritation effect of Roentgen rays.

The leucocyte reaction caused by the injection into guinea of 1 mg. and 1/100 mg. of tubercle bacilli of medium virulence is manifested the first 25 to 30 days as a double leucocytosis. This occurs in the following order: Relative and absolute polynucleosis and relative lymphopenia followed later by a smaller relative, but still considerable polynucleosis. This is succeeded by a lesser relative lymphopenia but a progressively effectual lymphocytosis. Studies of the blood picture of the guinea which were first irradiated and then injected with tubercle bacilli showed the following: A single irradiation of 100 R. has suppressed every leucocytic, lymphocytic and polynuclear reaction following the intraperitoneal injection of 1 mg. or 100 tubercle bacilli. Moreover, a single irradiation of 100 R. had a considerable effect in increasing or decreasing the resulting polynuclear or leucocytic reaction if administered after the tuberculin injection had had an effect. A secondary irritation manifesting itself as a leucocytic reaction is therefore to be assumed.

Experiments on the development of tuberculosis showed that there was no difference between the animals

which were first irradiated and then injected and the controls. Among rabbits, the struggle of the leucocytes and particularly lymphocytes against the bacilli, does not play a considerable role. In any case a study of the leucocytes alone cannot teach us anything of the effect of the Roentgen rays on the defensive mechanism of the organism. Intensive irradiation in animals causes most often a decrease in the ability to form antibodies. However, it seems certain that the antibodies already formed are completely resistant to the rays.

On the Amelioration of Pain on Swallowing in Laryngeal Tuberculosis by Endolaryngeal Irradiations. Josef Eisolt. Med. Klinik, No. 49, Dec. 9, 1927.

There are cases of extensive diffuse laryngeal tuberculosis with such extreme pains on swallowing that they irradiate to the ears. There are also spontaneous laryngeal pains independent of the swallowing act, combined with an extreme dryness of the throat, which makes the ingestion of food almost impossible and the nights unbearable. In such cases the author has had remarkable success with quartz light irradiation. The Bach quartz lamp is used. Before irradiating the patient is at first cocained and the Seiffert autoscope is introduced. The correct introduction of the quartz lamp rays on the part to be irradiated is controlled by means of a laryngeal mirror held in the cone of rays and directed towards the patient. The technic of the treatment is the easier the higher in the larynx the irradiation is to be performed. The explanation of the continued light anesthesia is as follows: The local light irritation, combined with an albumin coagulation effect, cause a hyperemia and consequently a transudation into the irradiated tissues. This results in embedding in fluid the fine sensory nerves and thus acts as an anelgesic similar to the anelgesic effect caused by the application to mucous membranes. The exact biological process of light therapy which represents a mesenchymal irritation, is not as yet well known.

On the Diseases of the Cervix Uterus. Briand. Progress Medical, Aug. 6, 1927.

Diseases of the cervix are discussed, including symptomatology and treatment. Treatment may be either medical or surgical, but one principle should always be kept in mind and that is that the treatment should reach the deeper regions of the cervix which have undergone pathological changes.

The various surgical procedures are given. The author also discusses the indications for high frequency current in cervical metritis. Effluvation with a hollow electrode (Francillon, Lobre and Ronche) is indicated in narrow or stenosed cervices obstructed by glairy, thick, adherent discharge. Electrocoagulation should be used in the large soft cervices. Sparking is indicated in slightly deformed cervices. Diathermy gives the best results in gonorrheal cervicitis.

Experiments on the Effects of External Factors on Erythema and Pigment Formation. R. Stahl and G. Simsch. Strahlenther. No. 27, 2, 1927.

The degree of erythema and pigmentation caused by ultra violet irradiation is influenced by many factors. The state of dilatation or constriction of the blood vessels has a considerable effect on the degree of erythema. Cold baths which resulted in cyanosis, and hot baths which resulted in skin reddening, were determining factors in the degree of erythema produced. Short cold baths which resulted in ischemia lessened the degree of the resulting erythema. The degree of pigmentation runs parallel, within certain limits, with the strength of the resulting erythema. Moreover, the degree of pigmentation also seems to vary with cold stimuli. Equal stimuli seem to have a particular sensitization effect and also a summation effect on the erythema formation and pigmentation.

Senile Cutaneous Keratoses in Relation to Cancer. J.A.M.A., 90:20; 1641.

Keratoses of the face, the neck and the hands in the aged are universally regarded as small skin cancers. They have the structure of cancers, develop into cancerous ulcers when traumatized, and may be readily cured by applications of radium. M. Dubreuilh of Bordeaux has contended for some time that their development, which is more frequently observed among the rural population, is facilitated by the ultra violet rays contained in the solar light. Such keratoses are, indeed, much less common in aged persons dwelling in the cities and living less in the open air. Dubreuilh reports a case which furnishes evidence for his theory. A patient subjected for a period of eighteen months to ultra violet rays has recently developed, in his service, an epitheliomatous keratosis closely resembling the small epitheliomas of the face observed in dwellers in rural communities who are constantly exposed to the sun. Dubreuilh explains, furthermore, that the rare occurrence of such epitheliomas in negroes of the tropical regions is doubtless due to some special defense action of their skin.

The Present State of Therapy of Female Genital Tuberculosis. P. Schumacher. Klinische Wochenschrift, No. 1, Jan. 1, 1928.

The author comes to the conclusion that Roentgen rays are the treatment of choice in female genital tuberculosis. Next to Roentgen ray therapy, surgery may be considered, if applied in the given indications. But these two methods are, however, not the only ones that should be used. Since tuberculosis is not only a local disease, but a disease of the entire organism, there should be not only local treatments, but the whole organism should be supported in its struggle against the tubercle bacillus. In this respect, physical-dietetic methods play the chief role, until complete cure is established. Rest, air and sun cures are of the greatest importance. In every case the author submitted his patient to irradiation with quartz light, which, accord-

ing to his experience, not only affected favorably the general condition, but also the local findings. At the same time he tried by means of a caseosan cure to cause an activation of protoplasm and increase in resistance of the entire organism. By a combination of both methods, successful results were obtained. The author warmly recommends them.

Diathermy Burns. Their Origin and Prevention. Kowarschik. Die Aertzliche Praxis, Vol. 2, No. 2, 1928.

Burns caused by diathermy can almost always be avoided, if the necessary care is employed, and if one possesses the requisite knowledge and the complete mastery of technic. As a rule it is unforseen circumstances which cause burns in diathermy. To these belong the slipping off of the clamp with which the cable is fastened to the electrode plate. As a result of the sudden removal of the latter from the circuit, the enire current is concentrated on the metallic contact surfaces of the electrode clamp, which has an area of only 1 sq. cm. or less. The burn which thus arises is almost always of the third degree.

In the same way the raising of the electrode from the body when the current is still on, is accompanied by the danger of burning. Not infrequently cable defects can cause severe burns, particularly when the break is in the body of the patient. Cases in which the patient was burned during treatment because of the application of too strong a current or through the wrong application of electrode are rare.

The sensitivity should always be tested, and in cases where there is a disturbance of the sensation of heat, one should be particularly careful in the application of the electrode and the dosage of the current. This applies to cases of nerve injuries, neuritis, tabes, hysteria, etc.

Diathermic injuries are differentiated from the ordinary injuries caused by heat by two characteristics: 1. The extraordinary slight and many times total absence of pain; 2. The long time it takes to heal. One kind of heat injury that has only been observed in diathermy is the subcutaneous burn. The subcutaneous fat is overheated and becomes necrotic while the skin is at the same time not involved. Such a burn arises in a very fat skin. The underlying tissue is thickly infiltrated. There is hardly any pain, but exquisite tenderness on pressure. The infiltration disappears in the course of a few weeks without leaving any trace.

On Roentgen Burns. R. Muhsam. Zbl. f. Chir. 51, 1927, p. 3269.

The author considers slight and moderate Roentgen burns which can still be cured by salves and ointments, and more severe burns which necessitate surgical intervention. Severe Roentgen burns after therapeutic application still do occur even at the present time. Excision of the ulcer to the base may cause primary healing. Defects can be closed by grafts. Regarding the time of surgical intervention, the location and degree of pain of the ulcer as well as the general condition of the patient play a role. As long as the acute phenomena persist and as long as it is still possible to use salves and ointments, operation should be deferred. As soon, however, as the ulcer becomes covered with a foul exudate, operation must be undertaken because cancerous changes are not rare.

Self Observation of an Epithelioma in a Radiologist Cured by Prof. Bordier's Method. E. Marques. La Presse Medicale, No. 59, July 23, 1927.

This self observation shows the very good results obtained with diathermocoagulation on a small epithelioma of the face caused by Roentgen rays. This method, according to the patient who has been helped by it, is superior to all others. The author calls the attention of his colleagues to the efficacy of diathermo-coagulation and to the dangers to which they expose themselves in trying other methods.

The lesion was situated at the end and left side of the nose. It was treated by diathermo-coagulation under local anesthesia and excellent results followed.

Ultra Violet Glass Bandage. M. Mannheim. Med. Klinik, No. 7, Feb. 17, 1928.

The ultra violet glass bandage consists of glass which transmits rays up to 260 wave length. Its effects depend on the bactericidal properties of ultra violet rays, the excitation of hyperemic inflammatory processes, and the production of irritation effects. When the ultra violet glass bandage is used the wound does not need to be covered with salves, pastes or powders. The wound should be left alone and cure left to the effects of air and light. The ultra violet bandage is fixed to the body by means of plaster. The results are as follows: At first there is a great amount of secretion and necrotic tissues are sloughed off. In the next few days the wound becomes drier and new granulations are formed. These granulations progress from the edge to the center or arise from the wound itself. After a comparatively short time the wound closes. The dressing is to be changed every day or less frequently depending on the amount of drainage. The glass can be sterilized by boiling.

Sensitiveness of the Cancer Cell to Heat. J.A. M. A. 90:20;1644.

B. Mendel, a former assistant of Professor Goldscheider, publishes in the *Klinische Wochenschrift* a study that may prove to be of considerable value in the treatment of cancer. Mendel has been studying for many years the question whether it is not possible to destroy cancer cells by high temperatures such as the surrounding healthy tissues would be able to withstand. In extensive experiments with surviving cancer tissue of rats, which had been removed from the organism, it was shown, in vitro, that important metabolism processes in cancer tissue are impaired by temperatures above 41.5 C.; that under such circumstances—though,

in other respects, the conditions for life may be most favorable—the cancer tissue alone is killed by the heat. The nature of the damage to the cancer cells runs parallel with the elevation of temperature. At a temperature of 41.5 C., the cancer tissue is killed in twenty hours; at 42 C. in ten hours, and at 44 C. in three hours. It has been found human cancer tissue behaves in vitro in the same manner as that of the rat, and, since temperatures of 41.5 and 42 C. are compatible with the life of healthy human tissue, Mendel believes that a method that would produce such high and persisting temperatures would destroy cancer cells (cancerous tumors) in the body through the effect of heat. Mendel's researches suggest an intensive-"fever treatment" of cancer, but not inoculation with a fever, after the manner of the treatment of general paralysis by inoculation with malaria, as introduced by Wagner-Jauregg, but a so-called "artificial hyperthermia," by means of physical agents, such as has recently been employed with great success in the Goldscheider clinic. As reported a short time ago by Walinski, before the Berliner medizinische Gesellschaft, it proved possible, through the application of hot baths, with subsequent use of the pack and sodium chloride, which prevent the development of perspiration, to produce temperatures above 41 C. and to hold such temperatures up to seventeen hours. In general paralysis, syphilis of the brain, and tabes, the results were at least as favorable as are secured by means of the customary inoculations with malaria or recurrent fever. It should be emphasized, too, that, with this new method, the fever can be regulated, so that there is no danger for the patient, whereas, in the inoculation method, it is beyond the power of the physician to control the fever in any precise manner. There is, therefore, a technical possibility that intensive fever treatment of cancer may prove practicable. Just how successful such treatment may be, remains to be seen.

Physical Fundamentals of Light Therapy. H. Guthmann. Strahlenther. No. 10, 1927. (Sonderbande.)

Thermoelectric and photographic measuring methods were used. The conditions were as follows: 1. Sufficient light was transformed. 2. The constant of the source of radiation was determined. 3. The condition of the irradiation was not influenced by the decrease in light. 4. The spectral energy distribution was known or determined.

The distribution of light among the ordinarily used light sources was determined. (Carbon arc lamps, sollux lamps, spectrosoll lamps). The following points were investigated: The influence of the form of the irradiated object on the superficial dose; the reflection of the light on the skin surface; the behavior of the light in optically dense media; the superficial absorption relations in bodily metabolic products and other substances; the deep effect of light on living organisms. The rays around 300 are particularly active in the excitation of erythema. The changes going on in albumen have an effect in the occurrence of the erythema. Combined effects of rays under 280 can, under certain conditions, far exceed the effects of rays around 300. When rays over 300 are used, pigmentation greatly exceeds erythema. Pigmentation after irradiation with light under 300 is more evanescent than pigmentation generated by light of longer wave length. In the artificial ultraviolet rays the generation of a strong erythema is caused by extremely short waved rays under 212. If the short-waved rays are gradually filtered off, the rays above 300 take a corresponding larger part in producing the total effect. The more the short waved part is filtered off, the more the resulting skin reaction is similar to sunburn.

The rays of sunlight, above 300, have an effect on normal pigmentation processes. If short waved rays are added, there results after a sufficiently strong radiation, an acute erythema. This is identical with the acute erythema produced by artificial ultra violet rays.

Roentgen Biology of the Healthy and Diseased Skin. G. Miescher. Strahlenther. No. 27, 1927, p. 257.

Reaction points of various skin areas of the same individual are equal, but are different in different individuals. The course of the reaction occurs periodically. The hardness of the rays has no influence on the course of the reaction. A regular accompaniment of erythema is pigmentation. Three to four erythema waves and corresponding degrees of pigmentation can be distinguished. The histopathological pictures are of the greatest significance for the differentiation of the reaction pictures (particularly anomalies of nuclear division). Erythema represents inflammatory manifestations. It is yet impossible to identify the Roentgen reaction with immuno-biological processes. In the general phenomena after irradiation there are features which remind one of protein therapy. Much remains to be clarified by experimental investigation.

On the Therapeutic Interruption of Pregnancy by Roentgen Rays. W. Furst. Strahlenther. 27, 3, 1927.

The interruption of pregnancy by x rays is not advised ordinarily, except in a very few cases. One of the cases in which interruption by Roentgen rays is indicated is where operative emptying of the uterus is contraindicated. Killing of the ovum by Roentgen rays is always possible. Interruption of pregnancy by x rays may be complicated by hemorrhage and infection. The necessity for the interruption of pregnancy because of extragenital disease should be decided by the proper specialist. The indications for deep gynecological irradiation requires more gynecological investigation.

Ultra Violet Ray in Gynecology. S. K. Basu, Ranchi. The Antiseptic, Vol. 25, No. 1, January, 1928.

The Royal Academy for Obstetrics and Gynecology in Milan reports that the ultra violet therapy may be best applied in the different forms of tumors of the adenexa with exudation. The efficacy is quicker and better than that of other methods of treatment. Ac-

cording to Dr. Landeker, para and perimetritis offer the most useful field for ultra violet therapy.

Even if the ultra violet therapy be restricted to the inflammatory diseases of the adenexae, its field of usefulness is still great in that a large number of patients may be treated who would have otherwise had to lie about untreated in the hospitals and who would, in private practice, put the patience of the specialist to hard test. Metritis, cervicitis, erosions, vaginitis cases also come within the scope of ultra violet therapy.

Twenty-five Years of Experience with Heliotherapy in Surgical Diseases. Abs. J.A.M.A. 90:20, 1675.

Heliotherapy is the method of choice in surgical tuberculosis. The advantages of its application in mountainous regions are due to the greater intensity of the sunlight, its greater warmth, light and chemical properties, its richness in violet and ultra violet rays and its longer duration. Lowered atmospheric pressure, dry, clear air, free from dust and bacteria, constitute some of the other favorable factors. In his twenty-five years of experience at St. Moritz, Bernhard has treated with success the following types of lesions: 1. Wounds of various types, severe traumatizations of soft tissues, ulcerations due to circulatory or neurotrophic disturbances, gangrene, frost bites, roentgen ray burns, and infected wounds. 2. Osteomyelitis. 3. Fractures. 4. Syphilitis ulcerations refractory to the specific treatment. 5. Skin carcinoma after operative removal. 6. Rickets. 7. The large field of surgical tuberculosis. He has treated 2,000 cases of surgical tuberculosis embracing skin, tendon, mucous membrane and lymph gland tuberculosis, that of bones and joints, of the urogenital tract, of serous surfaces, bowel tuberculosis, tuberculosis of the visual apparatus, and tuberculosis with multiple localizations. Under heliotherapy, practically all cases of tuberculous spondylitis and hip disease get well without, or with only slight, deformity. In his first 1,000 cases of surgical tuberculosis treated by heliotherapy, 858 were cured, 120 were improved, 14 were unimproved, and 8 died, a mortality of 0.8 per cent. Six of the unimproved died later of their tuberculosis, bringing the mortality up to 14, or 1.5 per cent. Seventy cases of tuberculous serous peritonitis were treated, with only one death, due to tuberculous involvement of the lungs. The rest were all cured. He attributes the remarkable results to the bactericidal action of the actinic rays, to the stimulation of epihelization, to local hyperemia and to improvement in the nourishment of the parts.

Heliotherapy of Surgical Tuberculosis in the Lowlands. Abs. J.A.M.A. 90:20, 1676.

Kisch holds that the superior advantages of the high Alps over the lowlands for heliotherapy have been greatly exaggerated. His results over a period of ten years in the vicinity of Berlin paralleled almost exactly those of Alpine institutions. Heliotherapy is an activation, rather than a specific therapy. Hence, the fact that the lowlands lack the continuous succession of sunny days experienced in the Alps is not a disadvantage, since uninterrupted treatment is not desirable. Kisch is convinced that the therapeutic value of heliotherapy is chiefly to be attributed to the power of the sun's rays to produce hyperemia. He describes the plan on which he has given heliotherapy successfully to patients with advanced tuberculosis. It has proved particularly valuable as a preoperative and postoperative treatment with thoracoplasty.

Heliotherapy in the High Alps. Abs. J.A.M.A. 90:20, 1676.

The reaction of the organism, particularly the diseased organism, to the sun's rays is not well understood. The most important part, Rollier states, is probably played by the light. The latter influences the fundamental processes of vegative existence. The advantages of treatment in the Alps are discussed. He lays particular stress on the value of the complete sun bath. He never saw congestive phenomena, even in cases complicated by pulmonary tuberculosis. Lupus healed just as rapidly when the lesions themselves were screened, while the body was exposed. The skin plays an enormous role in the curative process. He considers abundant pigmentation a sign of a good local and general reaction. The warm rays produce a superficial and a deep anesthesia so that the pain of tuberculous joints and muscle contractures disappear after a few weeks of treatment. Fungous processes in the joint either disappear or undergo fibrosis. Muscles regain their volume and tone. The effect of the treatment on disappearance of tuberculous foci, formation of new joint surfaces and bone calcification are demonstrated in his roentgenograms. He believes that cold abscesses stimulate immune-body production and for that reason should be punctured as late as possible. Heliotherapy likewise exerts a splendid effect on certain nervous diseases, on anemia and rickets and particularly on certain common skin diseases such as acne, psoriasis and eczema.

Modern Status of Finsen Light Therapy. Abs. J.A.M.A. 90:20, 1676.

Reyn states that the adoption of the principle of exposure of the entire body has made a marked difference in the results of the Copenhagen Finsen Institute. Whereas, with the local exposure only 70 per cent of favorable cases were cured, the combination of the local and general exposure has given 90 per cent of cures. Severe cases, refractory to local treatment, yielded to the combination of the two methods. The length of treatment was materially shortened thereby.

Alledged Negligence in Not Using Roentgen Rays in Fractures. J.A.M.A. 90:20, 1640.

It has become a commonplace that, if only to protect himself against a charge of negligence, the surgeon should use roentgen rays in all cases of fracture, and many surgeons have been mulcted in damages when the result was bad, simply because they did not use the rays. But in some cases the patient declines roentgenography because of the expense. The surgeon is then relieved of the responsibility, but the importance of having the patient's refusal put on record is shown by the following case: A man claimed damages from a surgeon because he had not been treated for fracture, but for bruised muscles after a motor accident. A roentgenogram was not taken until thirteen weeks after the accident and showed fracture of the upper part of the right femur. The man then went to the London Hospital and was discharged as a cripple with the intimation that nothing could be done except a major operation involving bone grafting. The surgeon, on the other hand, maintained that from the first he advised the man to go to the hospital and submit to roentgen ray examination but that the man refused. The surgeon declared that he actually told the patient that he was suspicious of fracures and that the roentgen rays might reveal one or more, but he did not find definite symptoms. The plaintiff's story was a blank denial. He had never refused to submit to roentgen ray examination. Witnesses gave conflicting evidence on the point of the refusal of the patient. After taking four hours to consider their verdict the jurors felt they were entitled to better guidance than such evidence in a case in which a surgeon's skill and veracity were concerned and returned a verdict for the defendant, but they added this comment: "We are of the opinion that the surgeon should have protected himself by calling in another physician and repeating in his presence the advice that the patient go to a hospital and submit to roentgenography. Mr. W. E. Hempson, who for thirty years has occupied the post of solicitor to the British Medical Association, gave clear advice on this point in an address published in the *British Medical Journal*. He said: 'In my experience controversy frequently arises at the trial of an action as to whether the doctor did or did not recommend some particular form of treatment which the patient or a relative refused, and no conclusive evidence is forthcoming on the subject. My advice is to note in your books—such as this would suffice—x ray treatment advised and refused.' In addition, take the precaution of placing it on record in a letter to the patient and keep a copy of it."

a new agent

In Joint and Tissue Disorders

Three hundred and forty rhythmic, resilient strokes—applied to any part of the anatomy—are produced in a ten minute treatment with the new Articulator. In corrective results this machine supersedes and eliminates manual massage: in operation its simplicity and safety insure correct manipulation even with inexperienced operators. It has proved a definite and effective solution for impaired mobility, chronic inflammation, faulty posture and removal of scar tissue. Authentic reports are now available on numerous actual cases, many of long standing, that have been corrected completely by the use of the new Articulator.

Endorsed by universities, hospitals, physicians, and clinics

Treatment for correction of faulty posture, lateral curves or impaired mobility in the joints of the spine or chest.

Below: Treatment of finger joints. Here is evidenced the extreme delicacy of adjustment and applicability of the Articulator.

Treatment of spine and whole body. Ten minutes application in this operation substitutes one hour of manual treatment.

Write for additional information on this remarkable machine

Articulator Company

10226 Woodward Ave. INCORPORATED Detroit, Michigan